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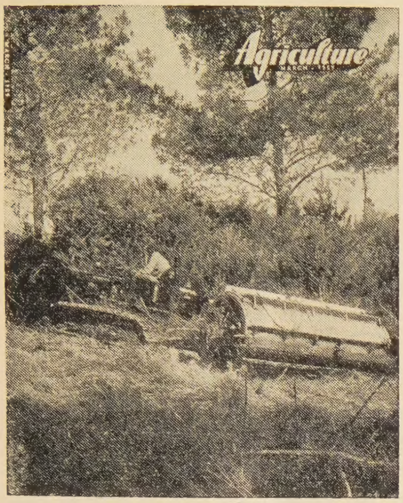
The first stage of bringing in pumice country in the Rotorua district—crushing the scrub with a heavy flanged roller—is well depicted on our cover. Much of the land development on the Rotorua-Taupo pumice areas has been on a very large scale, made possible only by the availability of powerful tractors and appropriate cultivating machinery. In recent years the aeroplane, for sowing and top-dressing, has been added to the already impressive range of mechanical aids to pumice land development.
[*R. V. Francis Smith photo*

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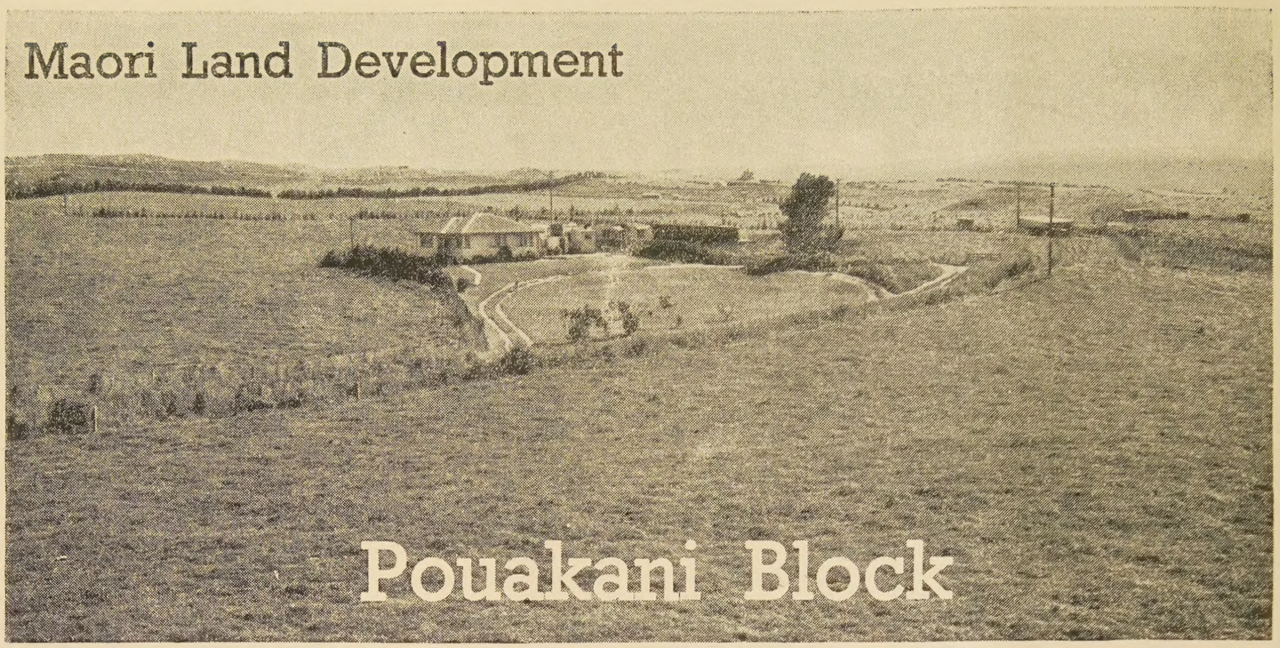
Maori Land Development

Pouakani Block



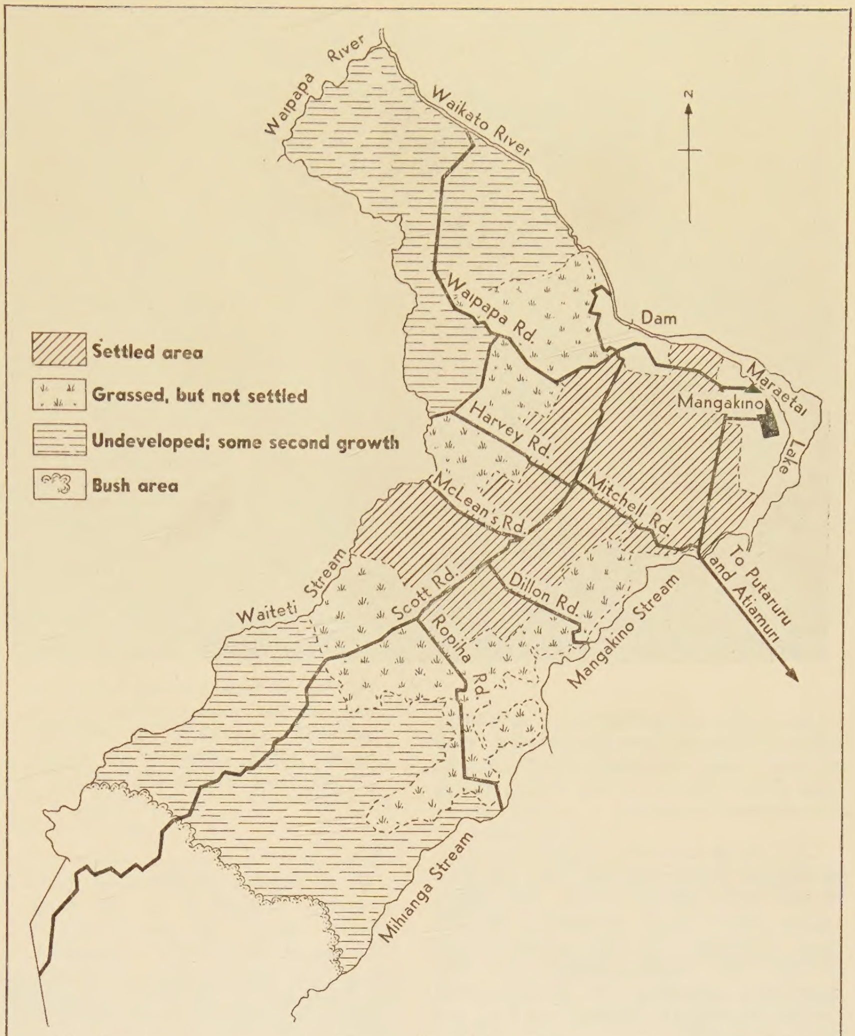
The well laid-out farm and homestead of one of Pouakani's Maori settlers, showing shelter in several places.

By C. R. TAYLOR,
Instructor in Agriculture,
Department of Agriculture,
Rotorua

THOUGH it may be said that the Treaty of Waitangi did not succeed in preserving for the Maori people "the full, exclusive, and undisturbed possession" of their land, the pre-emptive rights yielded to Her Majesty were a factor in controlling the wholesale alienation of tribal lands. Nevertheless, it was inevitable that the Maori should crave the many desirable things brought to the colony by the pakeha, and that to acquire them large areas of Maori land would be sold and so pass out of Maori ownership. Probably one of the most notable figures among the Maoris who clearly saw the danger to his people should they ever completely lose their tribal lands was Sir Apirana Ngata, Member of Parliament for the Eastern Maori electorate and subsequently Minister of Native Affairs. This article describes early efforts to initiate Maori land development, the legal machinery and organisation required to put it into operation, and finally some of the results obtained on one development block, Pouakani.

▼ Part of the settled area.

MAORI LAND DEVELOPMENT



The Pouakani development scheme. (See Table I on page 213 for acreage of various areas.)

IN the late 1920s, during Sir Apirana's ministry, Government recognised that State financial aid would be necessary if the remaining Maori lands were to be brought into production and thus preserved for the Maoris. Maoris would have to be prevented from selling the remnants of their tribal land except, perhaps, in the most exceptional circumstances, and they would need encouragement to develop and settle it with their own people. These steps would not only impart new vigour and direction to Maori life but would also provide very necessary work for the subsistence of Maoris living in many remote areas of the Dominion. (The need for the latter provision became evident in the early 1930s, when there was much distress among the Maoris.)

Legislation

Thus was born the concept of Maori land development. However, it would not be easily accomplished. Much money would be required and of this the Maoris had little or none, and there was no organisation fitted to undertake such a task. But where there is a will there is always a way, so it was not long before a start was made to build up gradually the necessary legislation and organisation for Maori land development and settlement as envisaged by **Sir Apirana Ngata** and his followers.

First, Section 23 of the Maori Land Amendment and Maori Land Claims Adjustment Act 1929 authorised the use of public moneys for the development of Maori land and the making of advances for farming to individual Maoris. Control was vested in the Minister, who was empowered to delegate his authority to the Maori Land Boards.

Subsequently various additional powers were given by Parliament in amending legislation, but it was not until 1936, in Part 1 of the Maori Land Amendment Act of that year, that a fairly complete code of legislation was assembled. At the moment all the relevant statutory powers are in Part XXIV of the Maori Affairs Act 1953.

All this legislation, over a period of nearly 30 years, was necessary to save the Maoris from what appeared to be inevitable disaster. It has enabled them to utilise what remains of their land to the best advantage and to become useful members of a modern European society.

Money for Maori land development comes from the Land Settlement Account and is appropriated by Parliament annually under the two heads Vote: Crown Land and Vote: Maori Land Settlement. Expenditure becomes a charge on the land (equivalent to a mortgage), and as settlement proceeds individuals may be given leases, their settlement being financed by individual advances, secured against the leases and their farming chattels. Repayments in the early or station stages are obtained from farming proceeds, and on settlement by repayment of the individual advances in accordance with mortgages. During the development stages interest is charged at 4 per cent, but when the settlers are established interest is between 5 and 5½ per cent, which includes a charge for supervision.

This brief outline of events leading to Maori land development and settlement will aid appreciation of the results of all this planning and expenditure of public moneys as exemplified by development of the Pouakani Block, at Mangakino, which is described here. This block has been selected not because it is superior to any other block under development, but because it illustrates what can be achieved when all concerned (Maori owners, Maori lessees, and the administration) cooperate to make a thorough success of their task.

History of Pouakani Block

The Pouakani Block, situated in the extreme north-western corner of Taupo County, was given to the Wairarapa Maoris in 1897 by the Government in exchange for Lake Wairarapa. The block contains 30,486 acres, of which about half is not considered suited to development because it is in natural forest or is too rough and broken. The remainder, however, was covered in a bracken fern-tutu-tussock association typical of the vast, open upland plains of the Central North Island Plateau and was regarded as eminently suitable for potential farmland.

This typical farm dwelling belongs to one of the highest producers of butterfat (over 22,000 lb. annually) on the block. Average size of the 28 dairy units is 151 acres.

Generally its topography is gently rolling to fairly steep and broken, with several hundred acres relatively flat near the Waikato River, which forms its eastern boundary.

The soil of the block is entirely comprised of Taupo pumice ash, its particular type being known as Taupo sandy silt—a type possessing all the best features of this pumice ash shower as demonstrated by the successful farming of similar land (Ngakuru-Waikite Valley, etc.) in the Rotorua district.

From 1897 to 1946 the Pouakani Block remained virtually unknown except to the comparatively few who owned it and those concerned with land. This was due to its extreme isolation caused by complete lack of access, the nearest road being many miles away, with the formidable obstacle of the Waikato River between it and the block. The progressive utilisation in later years of this same obstacle for generating hydro-electric power finally overcame the problem of access.

The township of Mangakino, built through hydro-electric development, now occupies 683 acres of the block, and a further 787 acres have been acquired by the Crown for the Maraetai Dam and the associated township. Thus the long awaited opportunity to develop and farm this most desirable piece of country in the interests of its Maori owners came into being through the activities of an entirely different industry.

With the provision of first-class access the Board of Maori Affairs in 1946 approved of development and settlement of the Pouakani Block.

Legal formalities, however, always take time to complete, and in addition the organisation of such a large programme of developmental work also took much time, and it was not until 28 July 1948 that work began on the breaking in of the Pouakani Block.

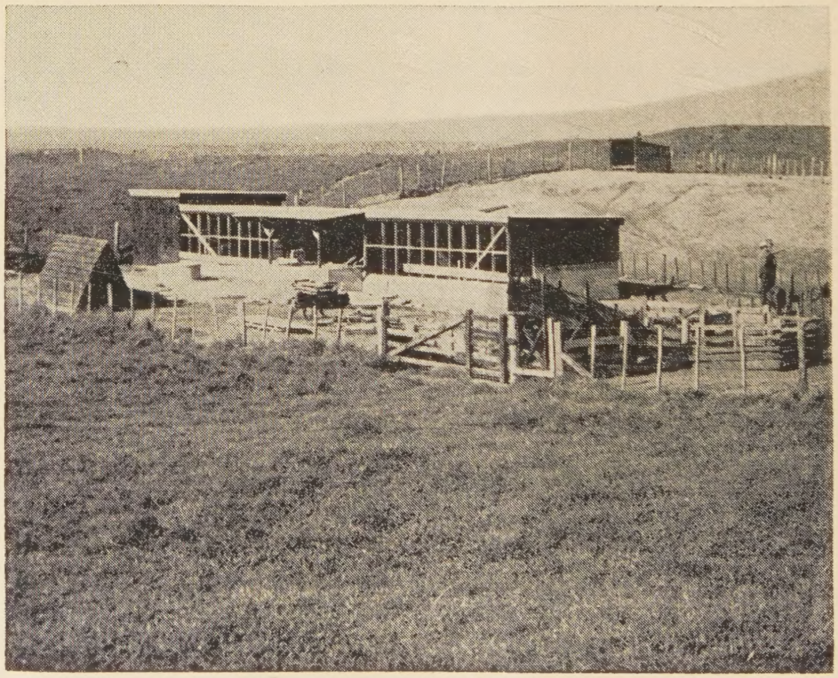
For the next 3½ years the job moved forward apace, a little more than 11,000 acres of new grassland being developed up to November 1951. No additional land, however, has since been developed, the later years being taken up with provision of fencing, water supply, internal roading, construction of buildings, etc., for settlement, and with improvement of pastures through proper grazing and management. The training of Maori recruits from the Wairarapa in pumice-land farming also took some time.

It is estimated that there remains only about 1,500 acres of easy country suitable for immediate development, the balance, about 17,000 acres, being either in standing bush and secondary growth or too broken and rugged to develop economically at present.

Present Utilisation of Block

Table 1 on page 213 shows the present utilisation of the block:

▼ A modern pig-fattening house nearing completion on the same farm. Good pig returns are a feature of this settler's management.



A good line of rising 2-year-old Jersey heifers raised by a progressive Maori settler for herd building and replacement.

TABLE 1—UTILISATION OF POUAKANI BLOCK

	acres	
Bush area	6,100	Maori owners get royalties from sale of timber
Developed area	11,261	6,285 acres unsettled and run as a station 4,976 acres settled as dairy and sheep farms
Leased to Crown	683	Site of Mangakino township
Taken by Crown	787	Maraetai Dam site, etc.
Potential farmland	1,500	
Balance	10,155	Somewhat broken scrub land and forest country not economic to develop at present
Total	30,486	

Cultivation Methods

Generally the cultivation methods were the well proved ones used by the Department of Maori Affairs and other Government Departments responsible for the breaking in of land since 1930. First of all wherever contour allowed the light scrub and fern were crushed with a heavy, flanged roller and then burnt, usually 3 or 4 months after crushing. This made a good, clean surface on which to begin initial cultivation.

Wherever ploughing was possible this was preferred to other methods of cultivation because it resulted in a cleaner, better consolidated, and more level seedbed. In some circumstances, of course, ploughing was not possible and giant discs were used instead. On completion of the ploughing the furrow was thoroughly rolled to press the furrow slice into contact with the subsoil, thus restoring consolidation and moisture movement through the closing of air pockets.

Finally an overlapped cut with tandem discs, a stroke or two with heavy chain harrows, and a second rolling with a Cambridge roller completed the seedbed in readiness for sowing down to permanent pasture.

Seed Mixtures

Generally the seed mixture used is that which has been successful in the pumice country over many years and is as follows:

	lb.
Perennial ryegrass	25
Cocksfoot	8
Crested dogstail	2
Montgomery red clover ..	2
Cowgrass	1
White clover	2
Total per acre	40

Sowings were made to take advantage of both spring and autumn and equally good results were obtained at these times. Seed was sown with 3 cwt. of cobaltised superphosphate per acre, and another 3 cwt. of superphosphate was applied 6 months and again 12 months after sowing. Thereafter 3 cwt. of cobaltised superphosphate per annum sufficed to keep pastures vigorous and thrifty. After seed and fertiliser were sown a third and final rolling with the Cambridge roller was sufficient to cover the seed adequately and provide additional consolidation to aid rapid germination and establishment.

Table 2 shows the acreages sown to permanent pasture and the dates of sowing:

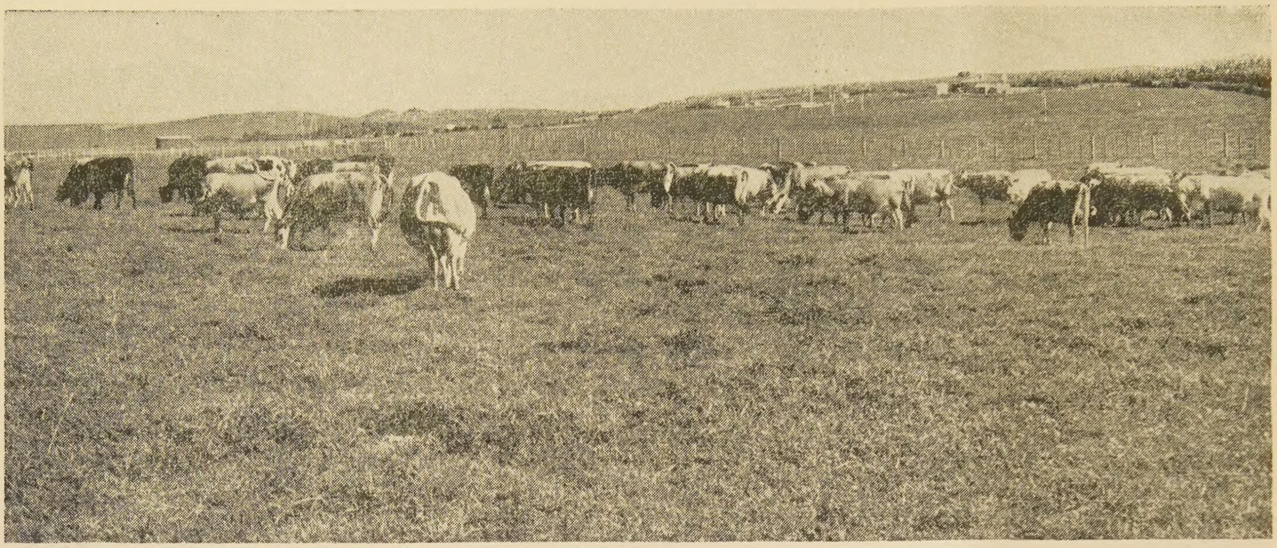
TABLE 2—AREAS SOWN TO PERMANENT PASTURE

Date sown	Area acres	Total area acres
March 1949	2,100	
September 1949 ..	700	
October 1949	100	
		2,900
March 1950	2,400	
September 1950 ..	900	
October 1950	1,800	
		5,100
March 1951	2,000	
November 1951	1,500	
		3,500
Total		11,500

Subsequently an extensive programme of internal road construction to provide access to farms, etc., reduced this total to the figure of 11,261 acres of developed country given in Table 1.

Proposed Utilisation of Developed Area

It was decided that 4,976 acres of the total developed area of 11,261 acres should be set aside for initial settlement as dairy and sheep farms under lease, leaving 6,285 acres to be farmed, in the meantime, as a station by the Department of Maori Affairs for the purpose of reducing the capital debt as quickly as possible.



This excellent dairy herd on one of the original training farms belongs to a settler with a good record of butterfat production.

On completion of this latter objective the residue was to be subdivided into about 25 additional dairy units and 8 sheep and cattle farms, making a final total of 53 dairy and 10 sheep units. To date the first part of this programme has been implemented with the settlement of 28 dairy and 2 sheep farmers on the 4,976 acres.

Stocking of Station Area

The first cattle bought for the block were 1,254 steers in 1950, and the first sheep were 541 lambs bought in 1951. Up to the end of the financial year 1953 all stock, except dairy heifers for settlement, were bought as stores, fattened, and then sold.

From 1954 onward, however, Romney breeding ewes and Polled Angus breeding cows have entirely replaced the bought-in store stock originally farmed. The best of the ewe lambs have been kept for flock building and replacements, the remainder being sold. All Romney wether lambs have been sold as fats either as milk lambs or shortly after weaning.

Weaner steer calves from the run cattle have usually been retained for fattening at 2 or 3 years of age, and the heifer calves have been kept as replacements or to increase the breeding herd.

Table 3 shows the station acreage available for grazing and the stock carried in 1950 and again in 1957, apart from the settled area which carries its own dairy stock.

TABLE 3—STATION AREAS GRAZED IN 1950 AND 1957

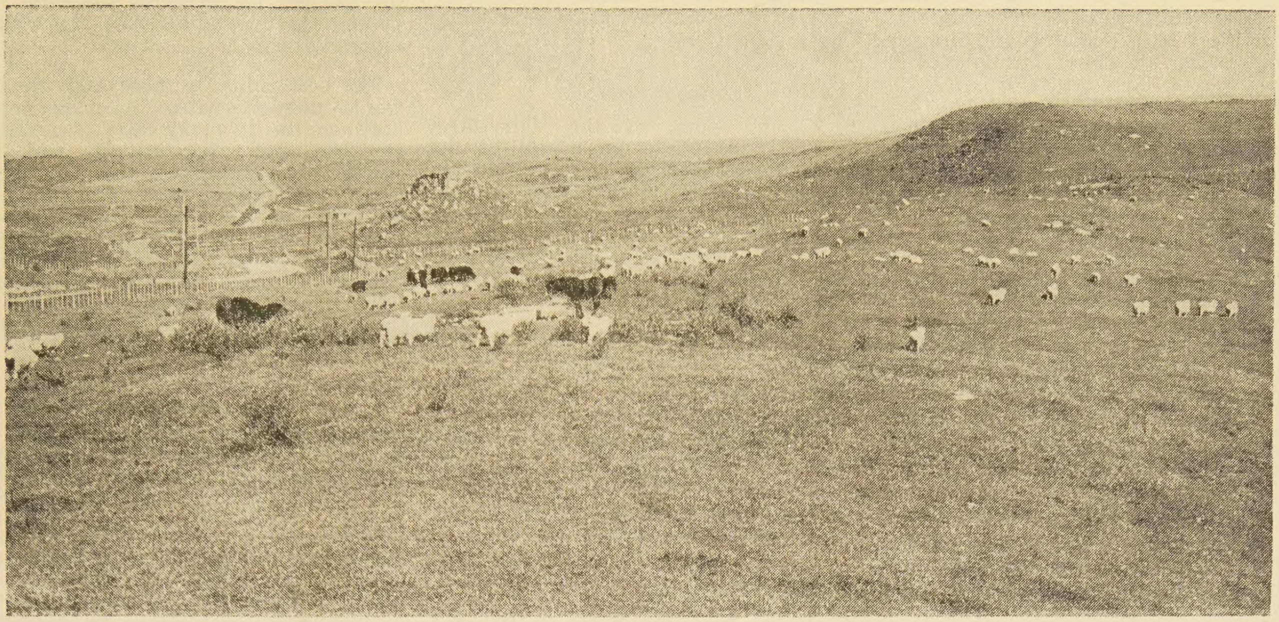
	Area acres	Stock
1 June 1950 ..	2,900	1,115 steers
1 April 1957 ..	6,285	9,490 breeding ewes 5,494 other sheep 490 breeding cows 712 steers 1,013 other cattle

To winter all stock on the station area it is necessary to grow 100 acres of swedes each year and save between 15,000 and 20,000 bales of hay. There is no difficulty in carrying the numbers of stock listed or fattening them as required.

Training Prospective Settlers

To provide for the efficient farming of that part of the Pouakani Block which was to be subdivided and settled as dairy and sheep units it was neces-

▼ A few of the same settler's replacement calves. Their growth and condition are evidence of his sound stock management methods.



One of the two sheep units settled in 1956. Both sheep and cattle are in excellent condition, and the settlers on these units should ultimately do very well.

sary to ensure that all prospective settlers were as proficient as possible in dairy and sheep farming on pumice country. To this end they were recommended in the first instance by the Wairarapa District Committee, comprised of Maori owners, as types likely to do well if given proper guidance and encouragement for a few years.

The next step was a 1951 decision to establish two training farms with a Resident Instructor in charge. These two farms, totalling between them some 269 acres, were located close to the township of Mangakino on what is, perhaps, some of the poorer of the country on the Pouakani Block.

The first six trainees entered the training course in 1951 and each year thereafter until 1954 others entered to take the place of those who had qualified for a farm unit. By 1955 sufficient trainees had completed their training for the initial number of farms the Department of Maori Affairs intended to make available on lease, so at this point it was decided to dispense with the training farms as such and use them for settlement.

After training all trainees were required to present themselves to the Waiariki Maori Land Committee to be tested on their knowledge of practical farming techniques before they were allowed to enter a ballot, the ballot system being regarded as the fairest means of disposing of farm leases.

The Maori Land Committee, which is a committee of the Board of Maori Affairs, comprises the District Officer and the District Field Supervisor of the Department of Maori Affairs, the local Commissioner of Crown Lands, and a local Maori farmer.

Farm Units

The farms are leased to the occupiers, who are almost invariably owners or the descendants of owners, for 21 years with the right of renewal for a further term of 21 years. At the end of 42 years (present arrangement) the occupier is allowed 75 per cent compensation for all unexhausted improvements. Farms are settled at Government valuation.

To qualify for a lease the settler, after his training period is over, has to serve a further 1 or 2 years on probation. If at this point his work, knowledge, and cooperation with the Department are judged to be satisfactory and he has received the approval of the Maori Land Committee, he is given a lease of his farm back dated to the time of his original occupation.

The average area of the 28 dairy farms is 151 acres, the smallest unit being 121 acres and the largest 187 acres; the variation in size is due to the topography of the settled portion of the block. The two sheep farms are 352 acres and 395 acres.

At the time of occupation (1952) by the first group of dairy farmers each farm was ring fenced and sufficient internal fencing erected to provide at least 8 to 10 paddocks. The settler was then expected to continue with further subdivision as time and opportunity permitted. In addition there was a water-supply system, a house, and necessary farm buildings. At first one tractor and set of essential implements was provided for use between two farms, but later each settler received his own equipment.

Subsequently all improvements were provided by the Department before settlement and in most cases each settler also had his own tractor and essential implements.

The initial issue of stock to dairy farms varied from 63 to 75 in-calf 2-year-old Jersey heifers and 2 bulls according to the area of the unit, In time the numbers of capital stock were gradually increased in accordance with the ability of the settler and feed supply available. Essential replacement stock were also reared and successfully carried. The two sheep farmers were each issued with 825 4- and 5-year-old Romney ewes, 20 rams, 68 Polled Angus cows, and 2 bulls.

Dairy Production

The success of the undertaking is indicated by the butterfat production shown in Table 4.

TABLE 4—BUTTERFAT PRODUCTION

	1952-53	1953-54	1954-55	1955-56	1956-57
No. of farms	6	18	24	24	26
Total fat for season (lb.)	62,601	182,304	344,888	378,586	430,226
Average fat per farm (lb.)	10,433	10,128	13,265	14,561	16,547

The figures for 1957-58 are not complete and have not been quoted.

As generally these Maori settlers had had very little training and practical experience in dairy farming before taking over their leases, it is felt that their performance to date has been very creditable indeed. With judicious herd culling and proper replacement of wastage, ample feeding at all times in the year, careful handling of stock, good milking technique, and sound pasture management, including the fullest possible utilisation of all herbage grown, an average production of 25,000 lb. of butterfat a year should be possible in the next few years. Some settlers, indeed, are well on the way to this objective, having produced more than 20,000 lb. to the end of February 1958, but others may require a longer period and some encouragement before they reach this goal.

Production of Pigs Unsatisfactory

Unfortunately, the general position concerning pigs on the settled dairy farms is not as satisfactory, very few farmers appearing to treat this side of their business seriously enough. With even average management additional revenue is possible from pigs each year, which would go toward paying the fertiliser account for the whole farm.

There are, of course, many other useful ways of spending a net return from pigs, but first of all it must be earned. Without a doubt good pig management provides a means for dairy farmers of Pouakani to improve substantially their financial positions and at the same time prove themselves good dairymen.

Pasture Management

Though most of the dairy-farm settlers appear to be aware of the significance of proper pasture management (regular topdressing, grazing, spelling, utilisation, weed control, etc.), it is clear that a few have yet to learn something of this before they can obtain the maximum production from their farms.

Special attention to ragwort and grass-grub control seems very necessary in places, and extra subdivision, more silage making, and better pasture utilisation would undoubtedly pay dividends to the less advanced of these settlers. Most, however, could profit by a stand of 6 to 10 acres of lucerne and the provision of more shelter for stock and homesteads.

Sheep Farms

So far only two sheep farms have been established. Little can be said of them at this stage, as they were settled only about 2 years ago and this is an insufficient period on which to base conclusions. However, the farms appear to be quite attractive propositions and the sheep and cattle are in good condition.

In these circumstances success or failure depends largely on the experience, initiative, and industry of the farmers. In the early years, or until the safe and economic carrying capacity has been determined by experience, it would be unwise to stock up too heavily or with too large a percentage of young sheep to make money quickly.

The best policy in these early years would unquestionably be somewhere between the two extremes of understocking and overstocking, and it should be remembered that the successful rearing and handling of young animals require far more time, patience, and skill than are required for older stock. Therefore a proper balance between the two classes of animal is all important, as, of course, is the balance or ratio between cattle and sheep.

Though the success achieved on the Pouakani Block shows the useful work being undertaken by the Government through the Department of Maori Affairs and related organisations, Maori land development has not been entirely successful. Such a vast project must necessarily have its ups and downs and here Maori land development differs little from the experiences of other State-controlled organisations and private enterprise engaged in land development and settlement. This in no way detracts from the credit due to all engaged in planning and carrying out the work necessary for the profitable utilisation of large areas of one-time waste Maori land, and assisting its owners to farm it to the best possible advantage.

Acknowledgment

Acknowledgment is made to officers of the Department of Maori Affairs, Rotorua, particularly Messrs J. A. Wilson and R. West, for assistance in the preparation of this article.

Digging of Main Crop Potatoes

DIGGING of main crop potatoes can take place when the tops have died back and the tubers have matured sufficiently to stand a reasonable amount of handling, usually from the middle of April onward. Fortunately, this fits in admirably with the movement of seasonal labour.

In most of the potato-growing districts digging is usually fairly straightforward, but in some seasons weeds are a problem, and it is now becoming common to spray this weed cover with an arsenical compound. This has proved very effective and has made digging and picking much easier under these conditions.

The poisonous nature of arsenical compounds must be stressed. Not only are they dangerous to the operator, but persons handling sprayed plants within 14 days must take precautions. Livestock must be kept away from sprayed areas—arsenite is said to attract cows, which may crash through fences to get at sprayed fields.

Provided a good mould has been put over the tubers, the often-used method of grazing with lambs is equally as good and there is no risk of poisoning.

All operations involving the handling of potatoes must be carried out with the maximum care to keep damage to the minimum. Damage early in the season becomes readily infected with dry rot spores, which spread rapidly and turn to wet rots during the long period of storage ahead. Damage can be kept to a minimum by:

1. Digging sufficiently deep to avoid cutting and to allow the passage of sufficient soil to cushion the potatoes as they move up the elevator and over the aprons.

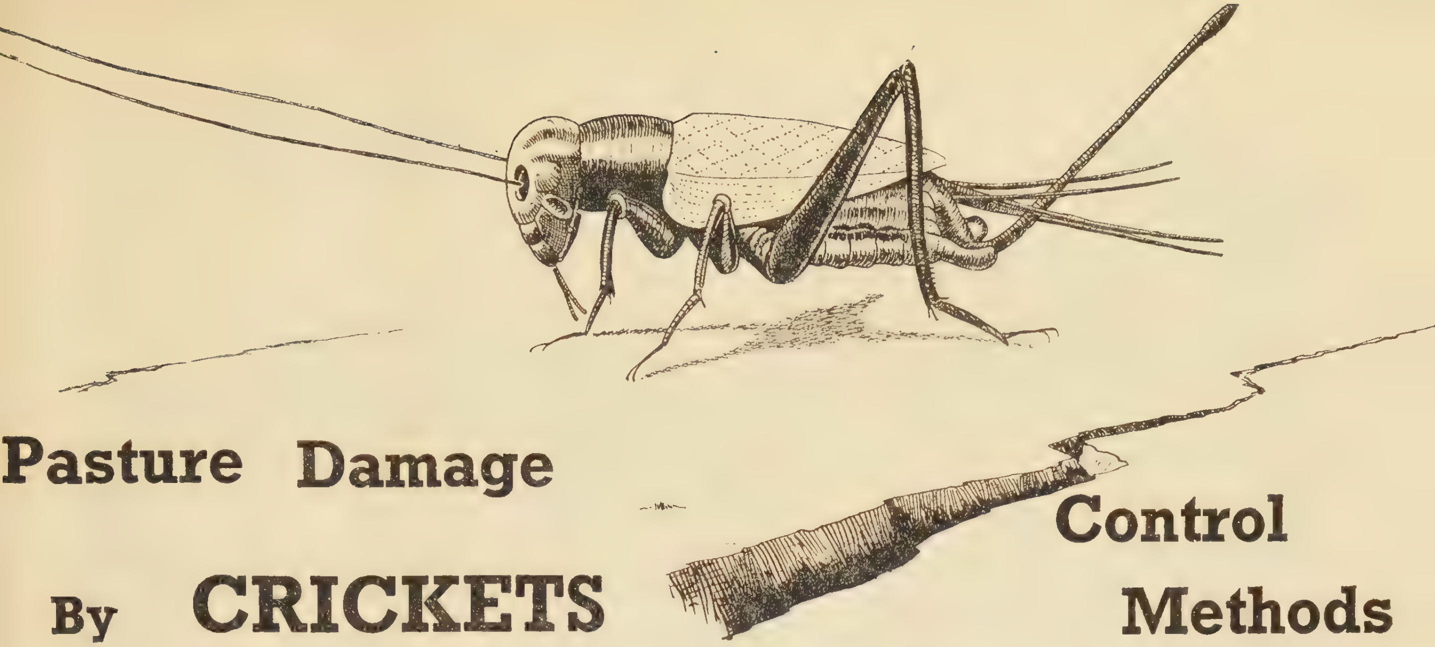
2. Regulating the speed of the digger and the aprons to cope with the crop and avoid unnecessary agitation.

3. Picking into wide-mouthed containers—preferably potato baskets with open-meshed bottoms to allow soil to go through.

The crop may be picked in two samples, namely, table and seed, or in one sample and graded later. This latter method is now finding favour, since the demand for a better grade of table potato is becoming more apparent.

Finally, reasonable precautions should be taken once the potatoes are in the bag. Do not allow the bags to stand out in the paddock longer than necessary, as greening takes place in a short time and severe loss can result from a snap frost such as occurred last year in many districts.

—*N. H. GREAVES,*
Fields Instructor,
Department of Agriculture,
Timaru



Pasture Damage By CRICKETS

Control Methods

By C. M. BLICK,
Fields Instructor, Department of Agriculture, Warkworth

PERIODICALLY when seasons are favourable the population of crickets builds up to immense hordes which cause widespread damage to pastures in certain areas of the North Island. Severe infestations during the past two seasons have caused tremendous damage and heavy financial loss and have resulted in greatly intensified interest in this pest. The development of new insecticides and techniques for their application has also served to stimulate interest, as it is now possible to eradicate crickets economically from large areas.

CRICKET damage usually occurs during dry autumns, when pasture plants have little power of recovery, and continues until the cooler weather, when again the plants lack vigour required to repair damage. Consequently the effects of the ravages of the cricket are felt long after the pest has disappeared.

The cricket has been a pest in New Zealand for many years. Extensive damage was caused in the Hauraki Plains by this pest in 1911. The first reference in "The New Zealand Journal of Agriculture" occurred in the March 1916 issue, where it is stated: "In certain northern districts of New Zealand the black cricket (*Gryllus commodus*) often commits considerable depredations during summer." The cricket is not therefore a new pest, but as a result of research there are available new methods of control which have been welcomed by many farmers.

The mature cricket is black and about an inch long and has long hind legs which when used in combination with its wings enable rapid movement. A thorough investigation of the life history of the cricket has not been made in New Zealand, but observations have established the position fairly well. From February onward the light-coloured, cigar-shaped eggs about 1/10 in. long are deposited by the female into the turf or just below the soil surface. Some of these eggs could possibly hatch in the following few weeks if conditions were satisfactory, but hatching does not generally begin until early October.

From the egg emerges a nymph, which is very similar to the adult but which is wingless and very small. The nymph begins to feed immediately and as it feeds passes through a succession of moults until after several months it becomes a winged adult. The cricket is usually near the adult stage before damage is noticed.

The main effect of the cricket is felt in the Auckland Province and in particular in the Hauraki Plains and North Auckland peninsula, where soils and climate are ideal for this pest. Recently severe damage has been caused in Hawke's Bay Province, mainly in Waipukurau and Patangata Counties. In these areas many thousands of acres of pasture were eaten out by crickets last season. Crickets have also been reported in small localised areas in northern parts of the South Island, where, however, they appear to be of little consequence.

The occurrence of this pest is invariably associated with heavy soils which crack during dry periods, the cracks providing excellent shelter. Heavy cricket infestation is most unusual on a soil which does not crack, though small populations sometimes occur on such soils. The indication is then that these cracks are most necessary for the survival of this pest.

Soils which are subject to cracking have a high proportion of clay particles and the expansion and contraction of this clay as it is first wet and then dries cause cracking. Most severe cracking occurs during dry summers and autumns which follow wet winters and under these conditions most severe cricket infestations occur. Severe damage has also occurred in a dry autumn after a fairly dry winter when soils were not completely wetted and cracks of the previous summer were not healed.

The cricket population also increases after a succession of two or more seasons favourable to them. An example of this occurred in North Auckland recently. The 1956-57 season was favourable to the crickets and considerable damage was caused, and in the following season, which was again suitable, the numbers were built up to such an extent that severe widespread damage resulted.

Dry clay knobs and ridges crack readily and are usually the first to be attacked and damage moves progressively from such areas if suitable weather persists. The difficulty which is often experienced in establishing and holding good pasture in such places can often be traced to an annual defoliation by crickets. When the pasture on these dry areas becomes brown and parched in summer the cause is often considered to be lack of moisture unless a careful inspection is made. It is possible

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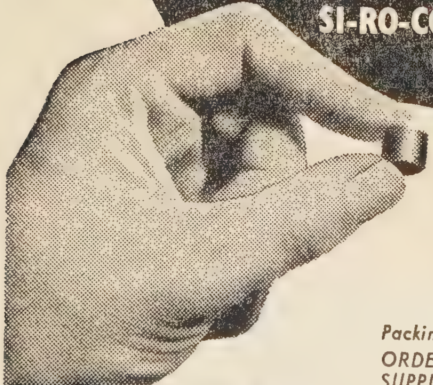

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If the cricket pest is unchecked, large areas of pasture may be completely defoliated.

even to walk over such areas where there is a heavy cricket infestation and not see a cricket. Crickets in advance of the path taken quickly retire to refuge in cracks and do not appear until the disturbance has passed.

Types of pasture and pasture management also influence the degree of infestation. Any form of management which will encourage ground cover and minimise cracking will result in a pasture with greater resistance to the depredations.

Paspalum has considerable resistance to the cricket as well as appearing to lack attractiveness. It also tends to hold the soil against cracking, so that strong paspalum pastures are seldom severely damaged. Management should be aimed at encouraging paspalum in young pastures.

Cocksfoot, though readily eaten by the cricket, has strong powers of recovery from severe damage. Cricket damage has often resulted in complete cocksfoot dominance of pastures where previously this grass was a minor constituent.

Ryegrass of all types is undoubtedly the most favoured of our pasture species and is greedily eaten by crickets. Heavy infestations of crickets will quickly eliminate ryegrass from pastures. On the other hand white clover appears to be much less attractive and is usually left until ryegrass has been eliminated. As a result of this preferential feeding well balanced swards which recover from cricket damage are often completely clover dominant and consequently produce much less than good mixed swards.

The cricket is directly responsible for this loss of production and also for the costs involved in correcting the unbalanced pasture. It is therefore good economy to take precautions against cricket damage and ensure against loss of production and later heavy expenditure.

Pattern of Damage

The pattern of damage begins with the plants adjacent to the cracks being eaten out and as these are eliminated so the damage radiates out until it adjoins that from a nearby crack and large areas are therefore completely devastated. The cricket is a surface feeder. The plants it relishes are closely cropped to the ground and, as damage is associated with dry weather, they have little hope of recovery. The crickets will also consume any seed which has been shed, so that there is often little hope of recovery of the pasture from self seeding.

Flat weeds are usually neglected by crickets and as a result have room to expand and become the dominant constituents of recovered pastures.

Damage continues if unchecked and will spread over large areas until rain fills the cracks and drowns the pest or cold weather partially immobilises and eventually kills them. The latter usually happens in late April or early May, but damage may continue, as it did last season, into early June. Temperatures which are low enough to affect the cricket will also cause a reduction in growth rate of the pasture, so that by the time the cricket has disappeared the pasture has little power of recovery.

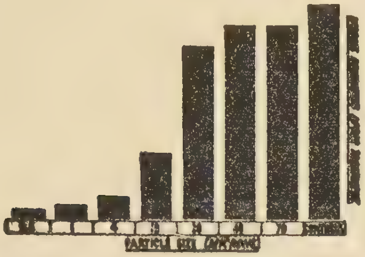
Badly damaged pastures often remain completely bare for months after the cricket has gone and unless endeavour is made to re-establish pasture, weeds such as thistles, dock, buttercup, rushes, pennyroyal, and many others will quickly establish. On fertile soils much of the buttercup and pennyroyal infestation results from the pastures being bared by crickets.

Minimising Damage

There are several means of limiting the cricket damage in addition to the use of chemicals. Mention has been made of the resistance of paspalum and every encouragement should be given to the establishment of this plant. Spring sowing of paspalum to hasten establishment should be considered. Paspalum is very slow to establish from autumn sowing, but when it is spring sown quite good cover can be obtained in 2 or 3 years.

TARTAN
topics

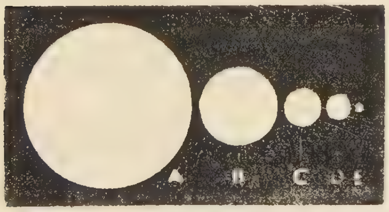
phenothiazine



This is a reproduction of a graph produced by the Animal Research Station, Wallaceville, to illustrate the efficiency of fine particle phenothiazine against worms in sheep.

TARTAN FENODREN liquid has a median or average particle size by weight of 3 microns (1/8000th of an inch!), and the above graph shows the high order of efficiency of phenothiazine within this size range.

When you get down to comparing these fine sizes, a microscope is necessary to compare the degree of fineness. However, the following diagram shows the particle size of some everyday materials on the same scale as typical particles of TARTAN FENODREN. For example, flour, fine by normal standards, has a particle size which would not be classed as a satisfactory average in an efficient phenothiazine product.



A: Particle of typical flour. *B:* Particle of face powder. *C, D & E:* Typical size range of Tartan Fenodren particles.

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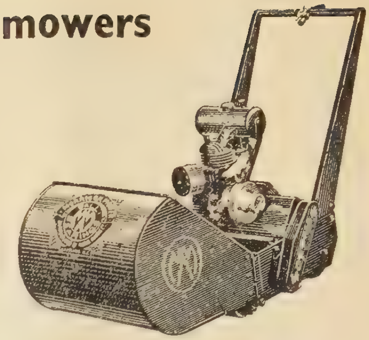

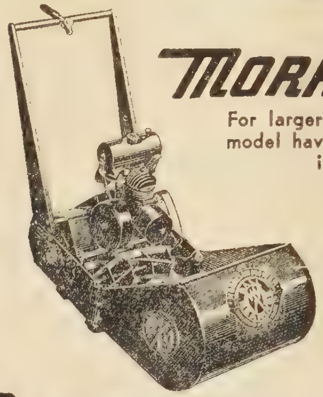

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The paspalum may be sown alone or with a crop of turnips in spring; then the ground is harrowed or lightly disced in autumn and the balance of the pasture mixture sown.

Any other form of management which is aimed at increasing the vigour of the pasture will help to minimise damage. Wet soils which pug in winter are more likely to crack in summer and drainage of these areas would be helpful. Pastures with a good cover are not likely to dry out so quickly; hence hard grazing will encourage the cricket.

Crickets are not usually found in numbers in cultivated fields, so that new sown grass is seldom damaged except where cultivated areas are adjacent to pasture or scrub which is infested with crickets. Severe damage has been found under such conditions, so it is always advisable to eradicate crickets from areas adjacent to new grass. Small populations have caused severe damage to seedling pastures.

Chemical Control

Little effort was made to control crickets with insecticides until the advent of DDT and BHC. In 1947 Banfield and Cottier, working in the Thames district, evolved a bait which has since been used extensively with excellent results. In these experiments the two insecticides were also used as dusts at rates up to 60 lb. per acre but without success.

Fortunately when the chemicals were administered as sprays or in bait form good results were obtained, but because of the ease of application baits became most popular. The baits consisted of 24 lb. of bran and 4 lb. of molasses per acre with DDT or BHC added. Since then it has been found that costs may be reduced by substituting sawdust for half of the bran. When bran is not available materials such as poultry mash may be used. The DDT and BHC were added at the rate of 1/10 lb. of 100 per cent active ingredient. These baits have been used extensively over a number of years and excellent results have been obtained.

Recently a new insecticide—dieldrin—has become available and has been in use for two seasons. This material appears much more toxic to the cricket than previously available materials and will probably supersede DDT and BHC. Dieldrin has proved very efficient as a spray and it is fortunate that the development of tractor spraying equipment and the use of the aircraft in farming have made it possible to spray large areas for reasonable cost.

An added advantage is that dieldrin has also given good results when applied as a dust. At the rate of 4 oz. per acre of 100 per cent material dieldrin as a spray has given excellent kills and appears to be effective for a month or more. Evidence of its effectiveness as a dust at the 4 oz. per acre rate is insufficient, but it appears that this rate may be satisfactory. However, a dieldrin-superphosphate mix is available containing 8 oz. of 100 per cent dieldrin in 2 cwt. of superphosphate and this is the recommended rate of application in the meantime.

These crickets were killed by a DDT bait. The flat weeds alongside them are thriving in the absence of competition from pasture species.

Method of Application

Baits are normally hand sown and if prepared without excessive moisture may be sown through a topdressing machine. Dieldrin has been applied as a spray by aeroplane, tractor mounted booms, and by hand machine with good results in all cases. Aerial application of dieldrin-superphosphate mix has also given good kills. A dieldrin-lime mixture made by spraying dieldrin into the lime gave a good kill after the mixture had been applied by spinner topdressing.

Time of Application

The correct timing of the application of insecticide is most important but often difficult to achieve. Very often farmers are not aware that crickets are going to be a problem until damage is observed and even if the crickets are killed immediately, recovery of the pasture is often slow, particularly if hot, dry weather prevails. Therefore those wishing to prevent this trouble should keep a careful check on pastures during December and January and judging on numbers present anticipate the possibility of damage and apply the insecticide before severe damage occurs. Applications under such conditions would normally be made in early February, but this would be varied according to the season.

If the application is made too early, however, a second spraying may be necessary to eliminate later crickets. In the Hauraki Plains G. L. Banfield has determined that it is preferable to delay treatment until damage is starting to show up around the cracks, though spraying should be done before the crickets reach full maturity, when they would be capable of laying eggs. If treatment is delayed to late February, it is possible to get away with one spray application without accepting too much cricket damage.

Repair of Damage

When a cricket infestation is allowed to run its course the crickets persist until cold weather eventually reduces their activity and they ultimately die. Repair of damage is then difficult because the colder conditions prevent rapid development of new sown pasture seed. Weeds are therefore permitted room for development.

It is a fact also that many of the soils which are likely to be damaged by crickets are unsuitable for spring sowing of grass seed. Cricket damage should therefore be repaired while growing conditions are still favourable in autumn. This entails killing off the crickets if they have not already been drowned by autumn rains and sowing of seed.

Some of the best results from undersowing and sod seeding have been obtained after severe cricket damage. Competition from the damaged pasture is negligible and undersown species have every chance. Where undersowing is not possible light discing or

CONTROL OF CRICKETS . . .

harrowing and oversowing usually give good results. On hill country the seed may be covered by moving a flock of sheep several times across the damaged area. Where autumn sowing has failed or not been possible the feeding of hay containing viable seed of desirable pasture plants during winter will be of some assistance.

To reduce the chance of cricket damage every endeavour should be made to produce vigorous pastures and manage them well. Paspalum and cocksfoot should be encouraged and close, continuous grazing should be avoided. Wet soils should be drained and wherever possible the management of the farm should be arranged to avoid pugging.

It is of great importance to anticipate the damage or at least identify it early so that the cricket can be eradicated and the pasture allowed to recover before damage is too severe. Control measures should consist of DDT or BHC applied in bait form or dieldrin as a spray or dust.

Repair of damaged pasture should be done during autumn before cold weather prevents a rapid cover of the bare ground.

Precautions with Insectides

Dieldrin is a dangerous insecticide which is poisonous to humans, animals, and bees, but it is not often realised that DDT and BHC are also poisons. These two have been in use for some time and many farmers have had experience with them and often this familiarity has bred carelessness.

Contractors and farmers are therefore warned not to take risks when using any of these materials. Even though there are not usually any ill effects after excessive contamination, there is always the possibility that residues will remain in the body and eventually build up to toxic levels.

Similarly farm animals should not be unnecessarily exposed to these insecticides. It is desirable for treated fields to be kept free of stock for a week or two or until heavy rain occurs so that the intake of insecticide is limited.

Apart from the safety of the stock there is also to be considered, with milking cows, the tendency for insecticide to concentrate in the milk, through which a house cow or milking herd could pass on further contamination. Bees are particularly susceptible to these chemicals, so care should be taken when they are used near flowering plants.

Acknowledgment

Acknowledgment is made to the article "Success of Poison Baits in Eradicating Crickets" by G. L. Banfield and W. Cottier, Journal of Agriculture", vol. 77, p. 569, which has been drawn on freely; also to G. L. Banfield, Instructor in Agriculture, Department of Agriculture, Thames, for his advice.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given during April as follows:

1YA Auekland, 7.45 p.m.

1 April—"Mechanical Drain Cleaning", by D. F. Scott, Machinery Instructor, Department of Agriculture, Auckland.

8 April—"Feeding Sheep", by E. Nelson, Livestock Instructor, Department of Agriculture, Papakura.

15 April—"Planning Your Winter Programme", by G. B. Haddow, Instructor in Agriculture, Department of Agriculture, Auckland.

22 April—"Woolshed Design", by D. Austin, Sheep and Wool Instructor, Department of Agriculture, Auckland.

29 April—"Drying off, Culling, and Stocking on a Dairy Farm", by J. D. J. Scott, Instructor in Agriculture, Department of Agriculture's Ruakura Animal Research Station, Hamilton.

1XH Hamilton, 12.33 p.m.

13 April—"A Review of Hydatid Control in the Waikato", by G. R. Mackintosh, Livestock Instructor, Department of Agriculture, Hamilton.

20 April—"Milking Machine Efficiency Checking", by M. J. McFetridge, Supervisor of Farm Dairy Instruction, Department of Agriculture, Hamilton.

27 April—"The International Federation of Agricultural Producers", by W. N. Perry, Federated Farmers, Hamilton.

1YZ Rotorua, 7.15 p.m.

8 April—"For the Bay of Plenty Orchardist", by B. M. Piper, Horticultural Instructor, Department of Agriculture, Tauranga.

22 April—"Young Farmers' Clubs", by Eastern Bay of Plenty Y.F.C. district committee.

2ZA Palmerston North, 12.33 p.m.

13 April—"Shelter for Market Gardens", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

27 April—"Wintering of Sows on Dairy Farms", by R. E. Burnell, Livestock Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

20 April—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.33 p.m.

6 April—"Winter Feeding Problems", by S. M. J. Stockdill, Fields Instructor, Department of Agriculture, Palmerston.

13 April—"Bees and Insecticides", by I. W. Forster, Apiary Instructor, Department of Agriculture, Oamaru.

20 April—"Hydatids", by R. G. Buchan, Livestock Instructor, Department of Agriculture, Gore.

27 April—"Grazing Lucerne", by T. Sewell, Instructor in Agriculture, Department of Agriculture, Gore.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m.

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m., and Fridays at 6 p.m. and 7.45 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month at 12.33 p.m.), Thursdays at 12.33 p.m.

2XA Wanganui, Wednesdays at 8 p.m. (stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m. (Taranaki stock market report).

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m. and 6.50 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m. and 7.15 p.m. (Lorneville and Gore stock market reports), Wednesdays at 12.33 p.m., Thursdays at 12.33 p.m.

Management of New Pastures

IN the late winter-early spring period new pasture is potentially capable of producing more and better feed than any other pasture on the farm. For this reason autumn management of newly sown grass should be designed to take advantage of this potential production.

There are two main points to consider. First, stocking in autumn is essential to achieve sufficient consolidation to allow stocking of the pasture under the wetter conditions usual in early spring. Secondly, grazing in late autumn must be carried out early enough to allow the pasture to recover before winter.

The most satisfactory way of obtaining both consolidation and autumn recovery is by mob stocking. Heavy stock concentrations consolidate the ground with minimum damage to the pasture and grazing is completed early enough to allow adequate recovery. In the colder districts correct timing of the autumn grazing is the critical factor in the successful spring utilisation of new pasture, and though in the warmer districts there can be more latitude in autumn grazing, it is still essential to allow the pasture to make a good recovery before growth ceases.

—*M. L. CAMERON,*
Instructor in Agriculture,
Department of Agriculture,
Timaru

LIVESTOCK PRODUCTION IN THE U.S.S.R.

By the ECONOMICS SECTION,
Extension Division, Department of Agriculture, Wellington

CHANGES in the structure and organisation of Russian agriculture are of considerable interest to New Zealand farmers, as it has sometimes been suggested that there is a large potential market in Russia for our meat, dairy produce, and wool. The fact that in 1954 and 1955 several thousand tons of butter were shipped to the Soviet Union has added force to this conviction. But rapid expansion of dairy and meat production over the last few years and the even more rapid expansion contemplated make the possibilities of establishing on a permanent basis a market of any magnitude for these products in the Soviet Union unlikely. The productive potentialities of the Soviet Union are very great and it is apparent that if greater capital resources had been allotted to agriculture and greater use made of incentives to individuals, agricultural output could be very much higher than it is; so much so that far from the U.S.S.R. being a possible market for our products the possibility of its becoming a competitor should not be overlooked.

IN recent months FAO has published in its "Monthly Bulletin of Agricultural Economics and Statistics" two studies of various aspects of Soviet agriculture. The first dealt with the dairy industry and the second, in September 1958, with "The Place of Livestock Production in the Agricultural Policy of the U.S.S.R."

The article begins: "The targets of the livestock production development plan announced in the U.S.S.R. in May 1957 have given rise to much discussion on all sides; even in the U.S.S.R. the economists in charge of the working out of this plan at first thought that the targets could not be attained before 1975. Nevertheless it was decided to fix the approximate date for their attainment as 1960 or at the latest 1962. . . .

"Without giving an account of animal husbandry problems in the U.S.S.R. in the past, three forerunners of the 1957 plan should be mentioned, namely: (a) the three year plan for the expansion of stock raising on State and collective farms (1949-51); (b) adjustments to the 1953 agricultural policy; and (c) the 1955 plan for livestock products."

The 1949 plan was drawn up when the livestock industry had recovered from the immediate effects of the war; between 1946 and 1949 cattle numbers had increased by 24 per cent, pigs by 73 per cent, and sheep and goats by 23 per cent. Cattle numbers in 1949 were actually greater than in 1941.

Livestock Ownership

Livestock in the U.S.S.R. fall into three categories. Firstly, those owned by the kolkhozy, the collective farms. These may be considered as compulsory cooperatives, the return to the individual member up until recently being determined by the extent of the compulsory deliveries of grain and produce to the State. The second category of livestock are those held by the sovkhozy, the State farms. These may be considered simply as State-owned farms with a manager and a team of hired workers. The third category are those owned privately by individual members of the kolkhozy.

The total number of livestock in the U.S.S.R. in 1956 were as follows: Cattle, 70.4 million (including 30.9 million cows); pigs, 52.1 million; and sheep, 125 million.

The 3-year plan adopted in 1949 aimed at developing the State-controlled sector, pressure being brought to bear on individuals to sell their stock to the kolkhozy. This policy impeded the expansion of livestock numbers and at the same time came up against other difficulties, including the shortage of fodder. By 1953 the kolkhozy owned 30 million cattle compared with 21 million in 1949, while the total of privately owned cattle had fallen from 30 million to 22 million. The overall increase was thus very slight.

In September 1953 an attempt was made to remedy this situation by allowing the kolkhozy to sell their produce on more favourable terms and for them to be provided with additional capital to build up livestock numbers. Taxes and restrictions on private stock ownership were also relaxed. With the exception of pigs, the collective and State farms failed to reach their targets, but the private sector considerably surpassed its quota.

Targets Set by 1955 Plan

The 1955 programme did not lay down any figures for the expansion of livestock numbers, but set substantially higher targets for meat, milk, and other livestock products, the emphasis being on higher production by better feeding. Considerable increases in the areas to be devoted to fodder crops, especially maize, were planned.

TARGETS OF THE 1955 PLAN FOR LIVESTOCK PRODUCTS AND FORAGE PRODUCTION

	1953 production	1960 target
Meat (million tons) ..	5.8	12.6
Milk (million tons) ..	36.5	76.2
Eggs (1,000 million) ..	16.1	37.8
Wool (1,000 tons)	235.0	414.0
Fodder grains (million tons)	*	65.5
Feed concentrates (million tons)	12.0	65.0
Silage (million tons) ..	32.0	176.0
Roots (million tons) ..	9.0	38.0
Potatoes (million tons) ..	5.0	25.0
Coarse fodder (million tons)	129.0	178.0

* Not available

These goals were not greatly changed in 1957, but those for meat and milk were raised in keeping with Mr Krushchev's slogan, "Overtop the milk, butter, and meat per caput production in the United States". Raising butter production up to the American level is a readily attainable target and it is claimed that per capita production in 1957 reached this target.

Beef production is to be raised from 2.2 million tons in 1956 to 7 to 8 million tons; pork from 2.6 million tons to 10 to 11 million, mutton from 100,000 to 500,000 tons to 1.2 million, and poultry meat from 500,000 tons to 1.5 million.

These increases will not come about through the expansion of livestock numbers alone, though a 40 per cent increase in cattle numbers is envisaged, and this will produce an additional 1.5 million tons of meat. An increase of 2 million tons is expected to come about through improved feeding and reducing the travelling time between farm and slaughterhouse. An increase in cattle numbers on the sovkhozy in newly developed areas will be responsible for 700,000 to 800,000 tons, and holding calves on collective farms until they are at least 18 months old will bring 400,000 tons. Lastly collective and State farms buying calves from individual owners to carry through for a longer period will supply another 700,000 to 800,000 tons.

About half (5 million tons) of the increase in pork production will come about through an increase in pig numbers. Extra feed (mainly potatoes) will be responsible for 2 million tons and the spread of pig keeping in newly developed areas will provide an additional 400,000 tons.

A number of measures are suggested which will help in the attainment of these targets, the most important being those designed to ensure that larger supplies of feed are available. Between 1953 and 1956 the area in maize was tripled and the area in annual grasses increased two and a half times, but

LIVESTOCK IN U.S.S.R. . . .

the area in perennial grasses, wild hay, and roots declined considerably.

The private sector will still have an important part in this expansion and the authorities, though perhaps regarding it as a necessary evil, have accepted this fact. At present it is the main producer of milk and meat and provides the individual peasant with an income almost equal to his share of the kolkhozy (collective farms) profits. The abolition of compulsory deliveries as from the beginning of 1958 will enable individual peasants to sell part of their produce at a higher price, though they may be expected to dispose of some of their calves, for example, to the kolkhozy.

The kolkhozy will have a major part in the expansion of livestock production, especially as they will not have to devote so much attention to grain, which will become to a greater degree the responsibility of the sovkhozy (State farms). An important change has been the sale to the kolkhozy of the State-owned tractor stations, for which previously there was a dual system of management that must have been responsible for a good deal of confusion. State ownership of the tractor stations was one means by which the State retained a measure of control over the operations of the kolkhozy. Productivity on the kolkhozy has always been low and in 1953 was even below the 1940 figure, though by 1956 there had been some improvement.

The sovkhozy have expanded most in recent years in the undeveloped lands in the east and have concentrated most on grain production. In future, however, they will also be expected to increase their output of livestock products.

Farmers in the U.S.S.R., whether organised in collectives or acting as private producers, can sell their products to the State or on the free market, though the latter is supplied mainly by private producers. Consumers can buy in State-owned shops and in the open market, which in 1955 supplied about 30 per cent of the dairy produce consumed, over 50 per cent of the meat, and 70 to 80 per cent of the fruit and vegetables. If the supply of foodstuffs in the State-owned retail shops is increased, prices in the free market can be expected to decline, as consumers will have a wider choice.

Policies and Prospects

Some comments on the policies outlined in the FAO article are set out below and attention is drawn to the difficulties that must inevitably be encountered in translating policies into action.

The dairy production target is the one most readily attainable; and, indeed, "to overtop" United States per capita production does not call for especially high total production. Per capita consumption of liquid milk in the U.S.A. is high, but that of butter and cheese is low and butter consumption has even been declining in recent years. The problem facing the Americans at present is not to increase dairy production, but to find acceptable methods of reducing it.

The programme to expand meat production is much more ambitious, especially for the short period allowed for its fulfilment. It calls for an enormous increase in the amount of feed available and for a rapid build-up in capital stock numbers. This, in turn, means that as large a proportion as possible of breeding stock must be held back from slaughter, which will, of course, reduce the quantity of meat immediately available for consumption. The very large increases that are to come from better feeding would also suggest that rations for stock have, until recently at any rate, been far from adequate.

Threefold Increase in Fertilisers

Increases in fodder supplies will necessitate a larger area of land being devoted to fodder production. Such increases, if possible, suggest that much of the land has been producing well below its normal potential. An essential prerequisite to such fodder increases is a large expansion in the production and use of fertilisers. Recent reports suggest that a threefold expansion of fertiliser production by 1965 is contemplated.

If these vast plans are to be successful, much will depend on the effectiveness of the policy of giving the producers, whatever form of organisation they are attached to, greater incentives. Since the system of collectivised farming was introduced after 1928 the policy has been for the State to obtain agricultural produce from the collective farmers at very low prices. At the same time capital investment in agriculture has remained at a relatively low level. As a result there has been neither the incentive nor the means to expand production.

Meteorological Records for January

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	240	68.3	+ 3.4	82.1	53.9	13.54	16	+ 9.04	3.30	6	143
Auckland	160	68.5	+ 2.1	80.2	52.0	4.65	9	+ 1.47	1.36	30	188
Tauranga	12	67.4	+ 2.8	83.0	51.9	4.21	7	+ 0.27	2.15	13	201
Ruakura	131	66.2	+ 3.1	84.4	45.3	4.25	12	+ 0.77	1.20	30	184
Whakarewarewa ..	1006	65.0	+ 2.4	83.3	46.9	6.42	10	+ 1.89	2.11	13	190
Gisborne	14	66.7	+ 1.9	95.0	41.2	1.50	11	— 1.04	0.50	30	214
New Plymouth airfield	143	65.4	+ 3.8	83.8	51.0	3.78	10	— 0.59	1.52	29	245
Kaitoi	2125	62.4	+ 5.4	83.0	42.8	2.80	6	— 0.88	1.31	12	
Napier	5	66.9	+ 1.4	95.0	51.2	1.64	8	— 0.97	0.49	13	209
Wanganui	72	66.2	+ 2.7	79.9	52.2	7.43	5	+ 4.65	3.58	29	260
Palmerston North ..	110	65.8	+ 3.4	84.2	50.0	6.36	6	+ 3.16	2.64	29	242
Waingawa	340	64.2	+ 1.8	91.5	37.0	2.27	11	— 0.13	0.57	31	244
Wellington	415	63.6	+ 2.6	83.1	46.1	3.44	11	+ 0.36	1.02	29	266
Nelson airfield ..	5	64.2	+ 2.6	84.1	45.0	1.19	5	— 1.65	0.59	29	295
Blenheim	12	64.8	+ 2.2	88.1	38.4	0.53	4	— 1.46	0.30	29	252
Hokitika South ..	15	60.6	+ 2.5	75.8	41.2	5.46	7	— 4.26	2.13	12	294
Hanmer	1270	61.8	+ 2.1	89.5	36.0	2.09	9	— 1.44	0.58	12	243
Christchurch ..	22	63.4	+ 2.0	92.1	39.5	1.65	8	— 0.58	0.92	31	216
Ashburton	323	65.0	+ 4.0	99.0	36.8	1.74	8	— 0.89	0.57	14	202
Timaru	56	63.4	+ 2.8	85.2	38.8	1.64	10	— 0.73	0.42	14	200
Alexandra	520	66.4	+ 4.7	97.0	42.0	2.55	8	+ 0.71	0.88	11	284
Taieri	80	60.8	+ 3.0	92.6	35.8	2.03	10	— 0.35	0.60	12	248
Invercargill airfield ..	0	58.4	+ 2.2	84.5	39.1	2.66	10	— 1.07	0.56	1	235
Chatham Islands ..	150	58.2	+ 0.9	70.8	42.6	3.38	12	+ 1.60	1.16	13	

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Food and Health	1/6
The Child and His Family	1/-
Poultry Feeding	1/-
Crop Production	2/-
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Recent Research Work

WINTER LETTUCE

IN suitable localities winter lettuce can be grown in the open for market, but weed competition and lack of soil aeration are often limiting factors. Excess moisture can, to some extent, be avoided and aeration maintained by the use of raised beds. Good crumb structure of the soil, indicated by a high percentage of coarse aggregates, allows percolation of water and air and must be preserved from breakdown caused by the impact of heavy rain or the weight of implements. Mechanical cultivation is difficult and inefficient under conditions of heavy rainfall. Alternative methods that leave the soil undisturbed were investigated in trials at the Department of Agriculture's Rukuhia Soil Research Station, Hamilton, during the winters of 1956 and 1957.

TRIALS IN 1956 A peat mulch and chemical weed control were compared with cultivation by hand hoe on a clay loam. Lettuce was planted at 12 in. spaces in 4½ ft. by 12 ft. plots, with 44 plants per plot. There were 4 replications and treatments were:

1. Flat beds, minimum hoeing to control weeds.
2. Raised beds, minimum hoeing to control weeds.
3. Raised beds, weed control with chemicals, no hoeing.
4. Raised beds, frequent hoeing to keep soil loose.
5. Raised beds, peat mulch 1 in. deep, no weed control.

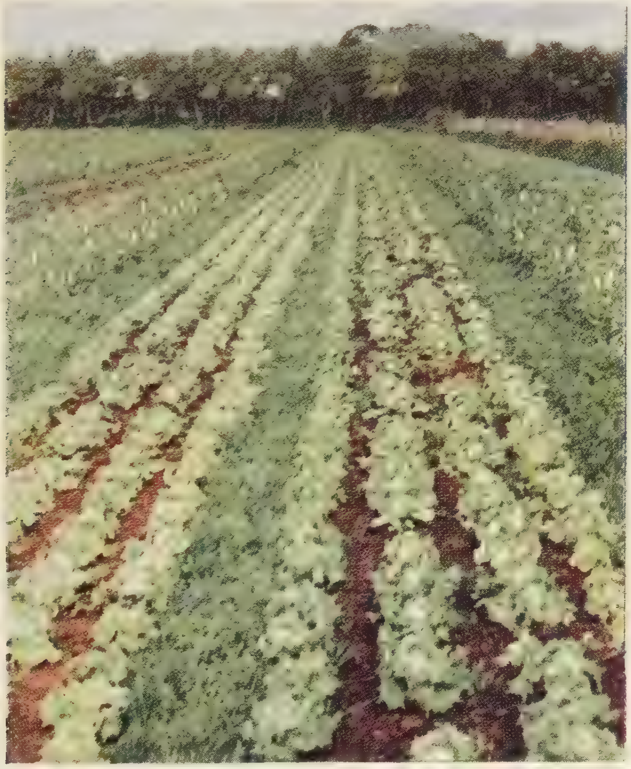
In treatment 3 the plots were sprayed with oktone in diesel fuel when a crop of weed seeds had germinated after planting. The lettuce plants were covered during spraying. The peat used in treatment 5 was raw, fibrous material free from serious weed seeds.

RESULTS Yields and percentages of the larger soil aggregates were:

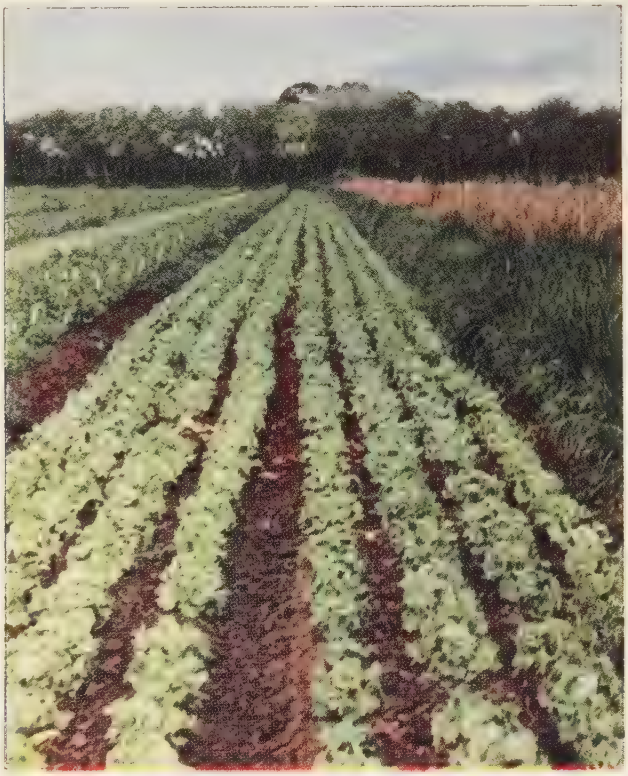
Treatment number	Number of lettuces harvested/plot*	Yield lb./plot	Per cent soil aggregates larger than 1 mm.
1	27	13.8	59.4
2	37	16.2	63.1
3	40	17.5	60.1
4	35	15.4	58.6
5	39	22.1	66.3
Significant difference	5 per cent ..	4.0	3.7
	1 per cent ..	5.8	5.2

* Differences not significant

There was less loss from disease with the chemical weed control method, and the greatest number of lettuces were harvested from this treatment, but not significantly so. The peat mulch (treatment 5) proved effective in preventing the establishment of annual weeds, gave the highest yield, and also the highest percentage of larger soil aggregates. The lettuces on this treatment were of a deeper green than those from the other treatments. The trial indicated that the peat mulch was beneficial and that cultivation should be avoided where other means are available for controlling weeds. The trial was repeated in 1957, with and without nitrogen added to the treatments. The peat mulch resulted in the best soil structure, but the effect was not reflected in the yields. Severe frosts damaged the crop and no significant differences in yields were obtained. *—H. A. BROWNING*



These lettuce beds were weeded by hand and mechanical hoeing. The green strip in the centre between the two beds shows the thick infestation of *Poa annua* (winter grass).



Excellent weed control was obtained in these two beds by spraying with CIPC at 4 lb. per acre before the lettuces were planted in June. The photographs were taken in October, just before the lettuces were harvested.

WEED CONTROL TRIALS

CONCURRENTLY trials were conducted to determine the best method of chemical weed control. In 1956 various materials were compared in a preliminary trial. Post-planting applications of natrin at 4 lb. per acre and monuron and diuron each at 2 lb. killed practically all the lettuce plants. Alanap at 4 lb. applied either before or after planting was unsatisfactory because of severe crop damage and poor weed control. Pre-planting applications of TCA at 10 and 20 lb. per acre caused little or no crop damage and gave fairly good weed control. TCA applied after planting resulted in poor weed control and some crop damage at the higher rate.

Unsprayed experimental plots of → winter-grown lettuce badly infested with *Poa annua.*

These clean plots were sprayed with CIPC immediately before the lettuce was planted. The photograph was taken 10 weeks later.

CIPC at 3 and 6 lb. before planting caused no appreciable damage to the lettuce and gave excellent weed control. Post-planting applications, while giving good weed control, were too severe on the crop. In general pre-planting applications of TCA and CIPC gave a better combination of crop tolerance and weed control than post-planting treatments.

A replicated trial in 1957 compared pre-planting applications of CIPC at 4 lb. and TCA at 15 lb. and a post-planting treatment of oktone at 4 lb. in 20 gallons of diesel fuel per acre. CIPC gave excellent control of *Poa annua* and fairly good control of land cress (*Coronopus didymus*). TCA reduced *Poa annua*, but the land cress increased. The poor result with TCA was probably due to the leaching of the chemical caused by 1 in. of rain which fell soon after treatment and a further 5 in. in the following 4 weeks. Oktone gave good control of both weeds.

Though some treatments gave good weed control, there were no significant differences in the yields of lettuces. All plots were adequately topdressed with nitrogen, and possibly this tended to reduce the effects of the weed competition.

From these trials it was concluded that CIPC would be the best treatment for commercial use, as it is less dependent on the weather than TCA. Oktone is not yet available commercially and has the disadvantage that the plants require covering during spraying.

—*A. E. THOMPSON*

* * * *

COMMERCIAL APPLICATION

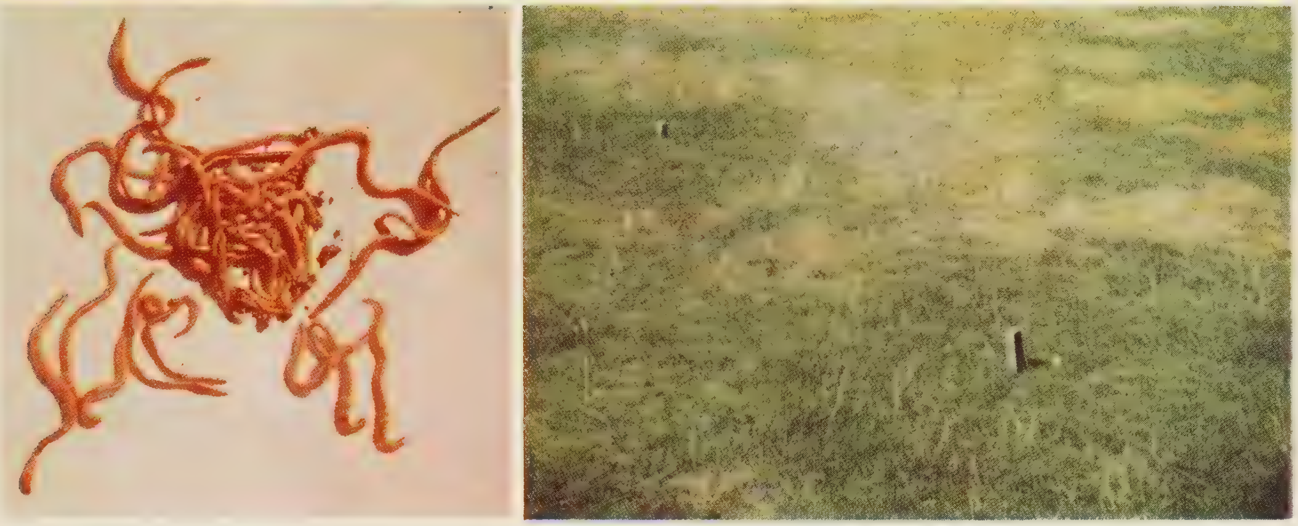
IN cooperation with W. Brandenburg, then Horticultural Instructor, Department of Agriculture, Hamilton, arrangements were made with a market gardener to use CIPC for weed control in his lettuce in 1958. Raised beds were prepared as usual and two beds 200 yds. long were sprayed in June with CIPC at the rate of 1 gallon per acre (4 lb.) the day before the lettuce was planted. Since volume of the spray is not critical, the grower's own spraying method was suitable. He did a preliminary spraying of the beds with water to determine the volume used. This was 15 gallons, approximately 100 gallons per acre. The CIPC was then mixed with 15 gallons of water and the beds again sprayed with the same tractor speed and pressure.

Except for one mechanical hoeing in July to loosen the soil the sprayed beds received no further attention and they remained weed free until harvest in October. Apart from a slight yellowing noticed about a month after spraying the CIPC had no effect on the lettuce and the crop was normal at harvest.

The unsprayed beds had to be hand hoed once to remove *Poa annua* and mechanically hoed three times for further weed control and aeration. This cost £5 for two beds, compared with 16s. for the CIPC. The grower was very satisfied with the chemical method of weed control.

—*F. B. THOMPSON*

Earthworms Improve Pasture Growth



Improved early spring growth, shown by green patches, due to earthworms of the species *Allolobophora caliginosa* (left). The worms were liberated at the pegs 4 years before the photograph at right was taken.

THE beneficial effects of earthworms on soil fertility and pasture production have been recognised by various observers in New Zealand for about 50 years. In this article encouraging results from an Otago trial in which worms were introduced into developed pastures are described.

TRANSPLANTING of earthworms was carried out as long ago as 1925 by Mr A. S. Ashmore, who had observed an improvement in pasture vigour associated with the spread of earthworm activity on his hill country property in the Raetihi district. Pasture improvement and increased carrying capacity resulting from the spread of earthworms on Mr Ashmore's property were reported by C. J. Hamblyn and A. R. Dingwall in 1945 (1).

At that time numerous trial introductions of worms from Raetihi were made by the Department of Agriculture throughout the country. Results were disappointing, and a survey of all trials, Mr Ashmore's Raetihi property, and other areas was made by R. L. Nielson, then Soil Biologist, Department of Agriculture Rukuhia Soil Research Station, who endeavoured to relate earthworm activity to various environmental factors, particularly the mineral status of soils. Adequate levels of **calcium** and **soil moisture** were found to be important, but phosphate and potash levels could not be directly related to worm activity.

Nielson also carried out much fundamental research and demonstrated increases in production associated with worm activity in both turf and pot trials.

These increases were attributed in part at least to the secretion into the soil by earthworms of an unidentified substance, the presence of which was established by biological tests.

Results of Nielson's work have been reported in the "Journal" (2, 3) and in a paper to the 13th conference of the New Zealand Grassland Association (4).

Research into the effect on earthworm activity of fertiliser treatments, soil fertility, and pasture growth carried out at Grasslands Division, Department of Scientific and Industrial Research, Palmerston North, have been reported by R. A. S. Waters (5) and P. D. Sears (6), who found that "the weight of earthworms was positively correlated with pasture production and approximated that of the stock which could be carried on the pasture".

By S. M. J. STOCKDILL,
Fields Instructor,
Department of Agriculture,
Palmerston

Early Otago Trials

A number of trial introductions of earthworms from Raetihi made in 1945 failed to improve pastures, because worms of the introduced species, later identified as *Allolobophora caliginosa*, were already present in the particular localities. One trial on well limed land in the Glenledi district of South Otago, where casting worms had not spread naturally, was successful and a pasture response was clearly observed (7).

The failure of a trial introduction made in the Hindon district was attributed to the very low calcium content of the soil, which was a yellow-brown earth, Wehenga silt loam. The trial site was fairly typical of many thousands of acres of unimproved hill country in the Lee Stream-Clarks-Hindon area, north-west of the Taieri Plains, where elevation ranges from 1,000 to 1,500 ft. and rainfall is 25 to 30 in. The extensive flat tops cut by steeper gullies are covered naturally with a snowgrass-fescue tussock association, but there are large areas which have reverted, after earlier cultivation and cropping, to chewings fescue and browntop dominance with some areas of regenerated fescue tussock and sparse snowgrass. There is a complete absence of the casting type of earthworm (*A. caliginosa*) over a vast area, except possibly in small areas adjacent to old-established steadings. Stock carrying capacity is about 1 sheep to 3 acres.

The unimproved land is very acid and low in calcium. Soil reaction of the first 3 in. of topsoil varies from pH 4.8 to pH 5.2 and calcium levels are usually 1 milligram equivalent per cent or less.

Trial on Developed Pasture

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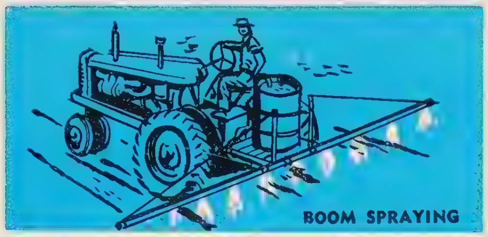

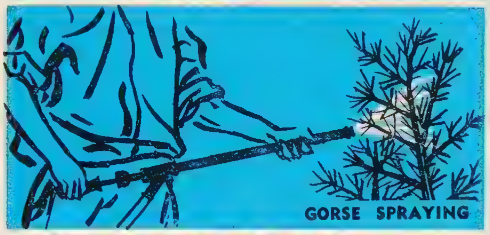

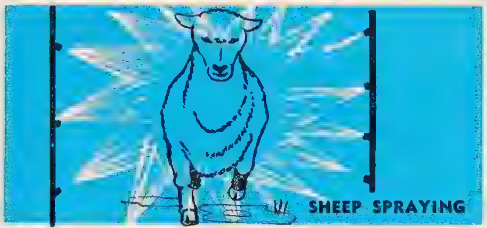

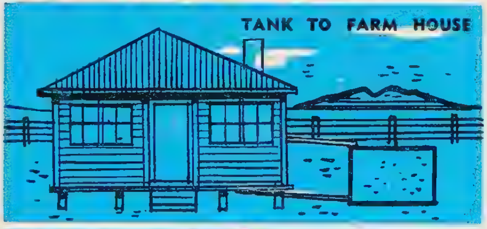

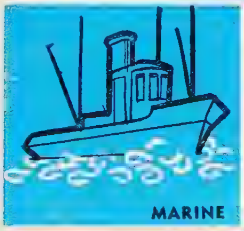

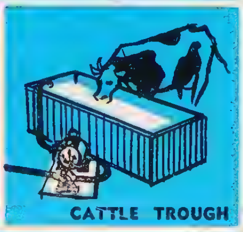

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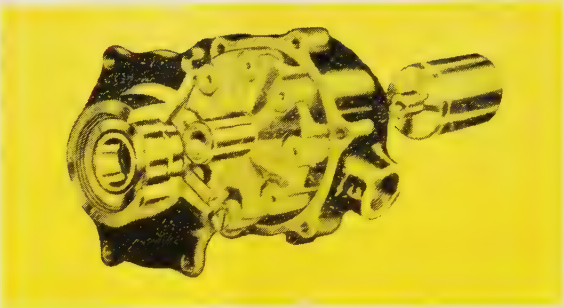

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High pressure nylon roller pump operates at 350 lbs. P.S.I. either from power take off or independent petrol engine. Little maintenance required.

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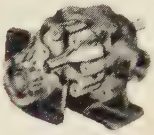
Nylon roller pump operates at pressures up to 200 lbs. P.S.I. High and low pressures for gorse or pasture spraying. Operates from power take off or independent petrol engine.



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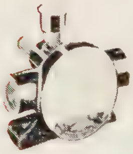

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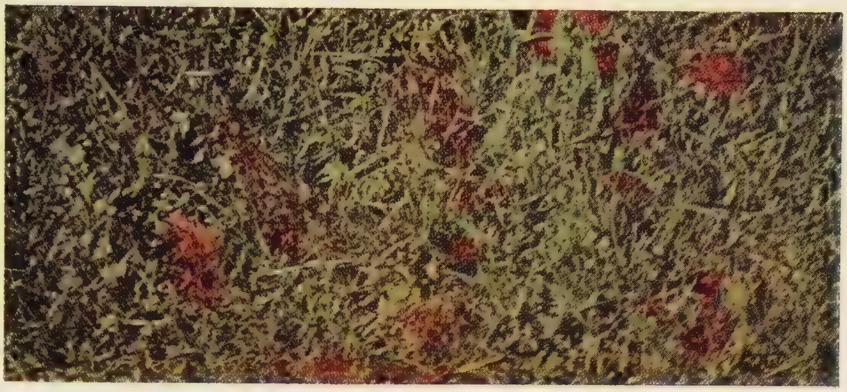
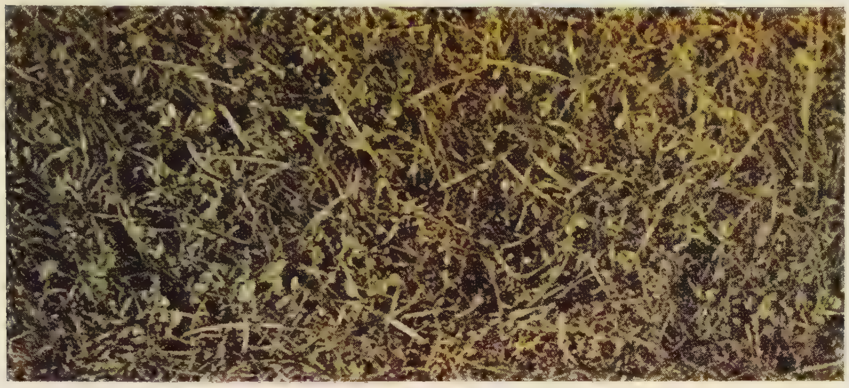
pastures on the property he then owned at Hindon, and in October 1949, at the instigation of R. L. Nielson, casting worms of the species *A. caliginosa* were introduced by W. R. Lobb (then Instructor in Agriculture, Dunedin) and the author to the oldest improved pasture, which was 6 years old at the time and producing well in spite of a complete absence of worms other than possibly a few of a native non-casting species.

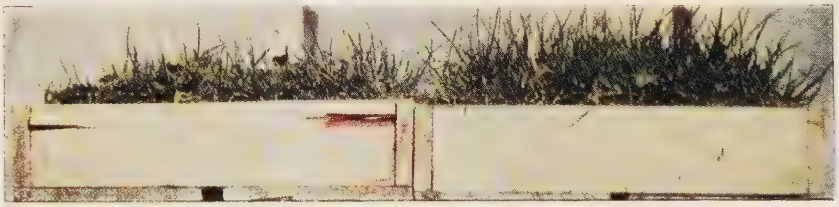
The trial area had been ploughed out of virgin snowgrass and fescue tussock in autumn 1940, put through a rotation of fodder crops, and sown to pasture with kale in spring 1943. The seed mixture was perennial ryegrass 20 lb., Italian ryegrass 10 lb., cocksfoot 10 lb., crested dogstail 2 lb., Montgomery red clover 5 lb., and white clover 4 lb. per acre. Lime and fertilisers applied are listed in Table 1.



Unwormed turf showing open nature of pasture with poor growth; dead grass and organic material on soil surface.



Wormed turf showing ground cover and improved production; no dead grass or organic material visible.



Boxes of unwormed (left) and wormed (right) turf showing the increased growth of the latter.

TABLE I—LIME AND FERTILISER APPLIED TO TRIAL AREA

	Crop	Fertiliser	Lime
1941	Turnips	3 cwt. reverted super.	1 ton burnt lime
1942	Turnips	3 cwt reverted super.	
1943	Pasture	3 cwt. reverted super.	1 ton burnt lime
1944	Pasture	3 cwt. super.	
1945	Pasture	2 cwt. super.	1 ton ground limestone
1946	Pasture	2 cwt. super.	
1947	Pasture		
1948	Pasture	2 cwt. super.	
1949	Pasture		
1950	Pasture	2 cwt. super.	
1951	Pasture		
1952	Pasture	2 cwt. super.	
1953	Pasture	1 cwt. super. + DDT	
1954	Pasture		
1955	Pasture	2 cwt. super. + molybdenum	
1956	Pasture		
1957	Pasture	2 cwt. super. + cobalt	

The pasture produced well in the first few seasons and was capable of carrying 8 sheep per acre during spring and summer. A hay crop taken in March 1946 yielded 80 bales per acre of predominantly red clover hay from 3 months' growth. There was some grass-grub damage in 1946 and 1947, but the field was still regarded as high producing in 1949.

Trial Procedure

On 10 October 1949 worms gathered from the vicinity of an earlier trial in the Leith Valley were introduced at each of a line of 16 pegged points 11 ft. apart. The method was to lift a turf with the spade, place a number of worms beneath it, and replace the turf.

The transplanting of sods containing worms from the source may have proved a better method of establishing the worms, but was avoided to minimise any possible effect from the transfer of soil to the trial area.

Slow Establishment and Spread

Establishment was slow and until March 1951 the best that could be said was that some worms were still present close to the turfs under which they had been placed.

By 30 November 1951, 2 years after introduction, the worms had become firmly established and had spread up to 18 in. Numerous small worms were found.

On 17 April 1953, after 3½ years, counts revealed up to 40 worms per square foot at points of liberation, reducing to about 10 per square foot 3 ft. away, with only 1 or 2 at a distance of 6 ft., which was the limit of spread.

Earlier Spring Growth

There is normally very little pasture growth in the Hindon area until October, but on 4 September 1953, 4 years after worms were introduced, circular green patches of earlier spring growth about 2 yds. across were observed at each point of liberation.

Castings were numerous on the greener patches, but diminished to only an odd casting ½ chain away. The patches of earlier spring growth shown on page 227 were photographed on 5 October 1953.

Pasture Improvement Measured in Field

Though the beneficial effects of earthworms had been the subject of

Contagious Abortion

can be prevented

The Department of Agriculture recommends that every heifer calf should be vaccinated against contagious abortion. Farmers wishing to enjoy the benefits of Calfhood vaccination should consult their veterinarian or a Livestock Instructor as early as possible.

TVL

TASMAN VACCINE LABORATORY LIMITED

P.O. Box 29, Upper Hutt

considerable research, increased pasture growth attributable to earthworm activity had not previously been measured in the field. The opportunity was therefore taken to compare pasture yield from areas where worms were active with those from areas to which worms had not then spread.

On 18 May 1954 areas 3 ft. square were trimmed to even height and enclosed by small wire netting frames, 5 at points where earthworms had been introduced and 5 in line ¾ chain away, which was just beyond the spread of worms.

The enclosed areas were cut with hand shears, and the produce weighed, 3 times in spring 1954. Clippings were returned to the areas after each cut. Green yields of pasture from each frame, dry matter percentages, and worm counts taken adjacent to each frame are recorded in Table 2.

The worms were identified by K. E. Lee, Biologist, Soil Bureau, Taita, the casting worms as *Allolobophora caliginosa* and the few, non-casting natives from the area without casting worms as *Octochaetus multiporus*. Worm activity was not strictly in proportion to the counts, particularly at frames 3 and 4. However, worm activity was observed to follow fairly closely the yield of pasture.

TABLE 2—GREEN MATERIAL YIELDS, DRY MATTER PERCENTAGES, AND WORM COUNTS

	Yields of green material (oz. per sq. yd.)			Worm count per sq. ft.
	22/9/54	18/10/54	20/11/54	18/5/54
	Without casting worms			
1	*16.5	*11.1	16.2	0
2	9.2	6.0	10.2	2
3	9.1	4.9	10.0	1
4	8.3	6.5	13.4	0
5	9.6	6.0	†16.8	2
Total (5 sq. yds.) ..	52.7	34.5	66.6	
Dry matter	30.4%	31.6%	23.2%	
	With casting worms			
1	20.6	15.8	20.4	87
2	25.1	16.4	21.3	80
3	22.5	15.5	19.3	7
4	13.5	9.2	18.6	4
5	14.8	13.3	19.3	48
Total (5 sq. yds.) ..	96.5	70.2	98.9	
Dry matter	28.9%	33.6%	21.4%	

* Higher fertility patch on this area with traces of dung.

† Patch of cow dung adjacent to this area affected yield.

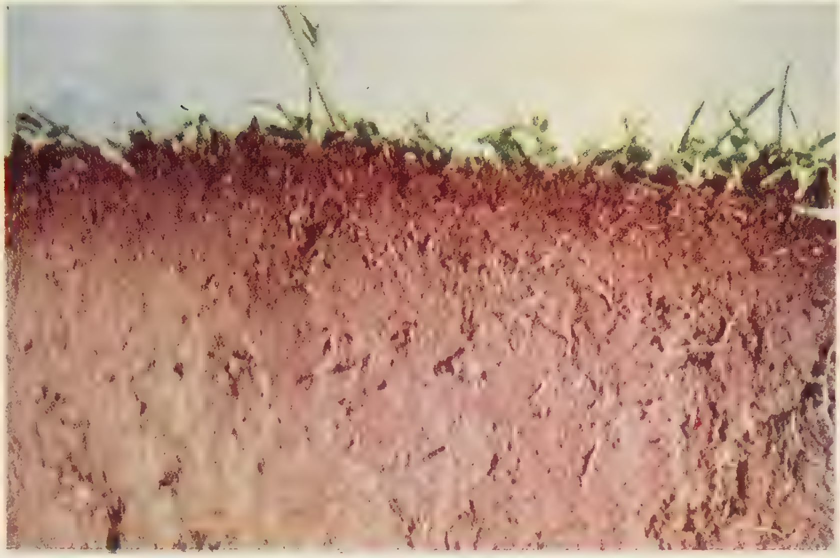
TABLE 3—ANALYSED YIELD OF GREEN MATERIAL

	Total of cuts at 22/9/54, 18/10/54, 20/11/54 lb. per acre
Without casting worms	9,320
With casting worms .. .	16,090
*Difference	6,770

Standard error as percentage of plot yield = 19.7.

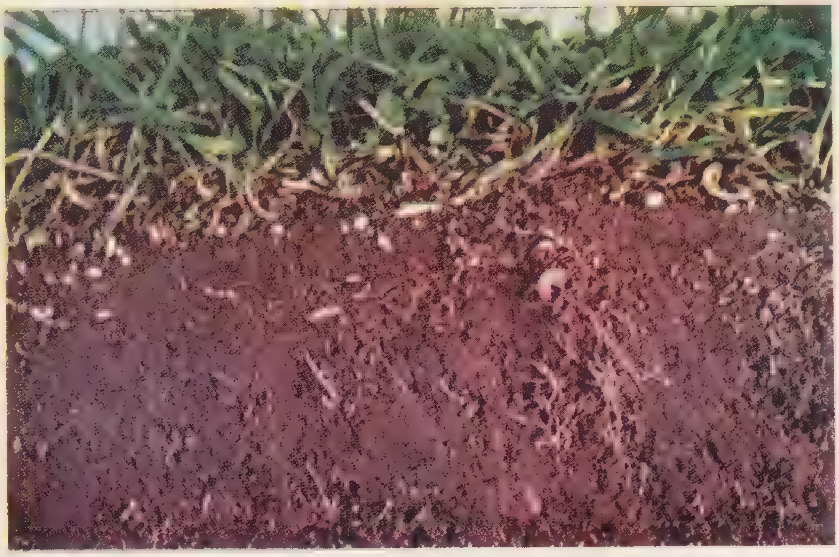
* Significant difference: 5% = 3,640
1% = 5,290

EARTHWORMS IMPROVE PASTURE GROWTH



▲ Unwormed profile showing mat of organic material at soil surface, dry nature of soil below, and poor growth.

▼ Wormed profile with no mat of organic material, which has been incorporated into the soil. The soil is moister and more friable and growth is better.



The yields given in Table 2 were subjected to statistical analysis and the analysed figures as set out in Table 3 show a highly significant difference in favour of the area "with casting worms". Because in a trial of this nature there could be no true randomised arrangement of treatments, this does not necessarily prove that the greater yield was due to worm activity. However, worm activity had by 1958 spread to about 2 chains from the introduction points and had engulfed the area which was "without casting worms" in 1954, when the yields were recorded.

The area of more vigorous pasture had spread to a similar extent and it is reasonable to assume that the yield increase of over 70 per cent was primarily the result of worm activity.

Soil Analysis

Soil samples taken on 9 May 1955 were forwarded to Rukuhia Soil Research Station for examination of physical and chemical characteristics. Though the soils from the wormed plots showed marked improvement structurally, it was not possible to demonstrate this through physical measurements owing to the instability of the aggregates formed.

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CRACKERS

Proved by actual Trials

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Tomoana FULL-FEED Dog Crackers

Chemical analyses are given in Table 4. The figures for loss on ignition, organic carbon, and nitrogen show clearly that organic matter has been removed from the surface layer and incorporated in the soil underneath. Organic matter has a high cation-exchange capacity and the cation-exchange capacities of surface and deeper layers have been modified in line with the organic matter transfer.

Calcium, too, has moved down the profile to a markedly greater extent in the wormed areas. The slow downward movement of calcium in the absence of earthworms was observed also in a liming trial on the same property, when 4½ years after application of the lime its effect was still largely confined to the surface inch of soil. In the worm trial the soil samples were taken nearly 10 years after the last application of crushed limestone. Worm population would have built up to any significant extent in the wormed areas only over the final 3 years.

Neither the physical nor chemical changes revealed in the analyses could adequately account for the marked improvement in pasture growth.

Effects of Earthworms Observed in Field

The first effect of earthworm activity observed in the field was the improved colour and vigour of early spring growth, which became obvious 4 years after introduction. This improved pasture growth had by 1958 spread about 2 chains and had followed closely the spread of the earthworms. Though there did not appear to have been any marked change in herbage composition (herbage dissections of cut material showed no pronounced trend), there were definitely more vigour and better ground cover on the wormed area.

The physical effect of the earthworms on the soil profile has been very marked and is well illustrated in the accompanying colour photographs, taken in April 1956.

In the absence of earthworms all dung and dead vegetation has accumulated on the surface to a depth of about ½ in., while the soil beneath lacks organic material and is of poor structure. Where earthworms have been active all organic material has been removed from the surface and incorporated into the topsoil, which is of a rich loamy texture.

In addition, earthworm activity has definitely improved the ability of the soil to absorb rainwater. The soil profile illustrations were photographed after a moderate rain which had followed a drought. The unwormed soil was dry and hard, and it appeared that much of the rainfall must have run off or been absorbed in the surface layer of organic material only to be evaporated by wind and sun. **Where worms were active the soil was moist and friable.**

Factors Responsible for Increased Production

The substantial improvement in pasture production resulting from earthworm activity cannot be attributed to any single factor, but is probably due to a combination of beneficial effects.

The chemical changes alone could not have accounted for the recorded increase in yield, but the redistribution throughout the topsoil of organic material and plant nutrients previously concentrated on the surface must have been beneficial. Though the analyses revealed no increase or improvement in the availability of plant nutrients, the enrichment and improved soil reaction (pH) of the deeper layers, though obtained at the expense of the surface layer, could have encouraged more vigorous root development and improved uptake of plant nutrients.

TABLE 4—CHEMICAL ANALYSES OF SOIL EXCHANGEABLE CATIONS

(milli equivalents per cent)

	*CEC	†TEB	Ca	Mg	K	Na	Per cent saturation
Without worms							
in.							
0-1	27.9	24.7	20.3	3.0	1.22	0.48	89
1-3	17.3	10.3	8.6	0.9	0.46	0.32	60
3-6	15.5	5.9	4.8	0.5	0.28	0.25	38
6-9	12.5	2.0	1.5	0.2	0.16	0.13	16
With worms							
0-1	23.7	19.4	15.2	2.6	0.99	0.61	82
1-3	19.5	12.0	10.4	0.9	0.33	0.30	62
3-6	16.2	8.3	7.0	0.8	0.22	0.27	51
6-9	13.5	2.3	1.8	0.05	0.19	0.21	17

RAPID TESTS AND ORGANIC MATTER

	pH	Ca	K	P	C	N	Carbon-nitrogen ratio	Loss on ignition
Without worms								
in.					per cent	per cent		per cent
0-1 ..	6.3	12	12	14	7.6	0.616	12.3	17.1
1-3 ..	5.6	8	5	4	3.6	0.288	12.5	9.6
3-6 ..	5.5	5	3	3	2.7	0.226	12.0	8.2
6-9 ..	5.3	1	2	2	—	—	—	—
With worms								
0-1 ..	6.0	11	10	10	6.0	0.498	12.1	14.6
1-3 ..	5.9	10	3	5	4.0	0.337	11.9	10.6
3-6 ..	5.8	6	2	4	3.1	0.254	12.2	8.8
6-9 ..	5.3	1	2	2	—	—	—	—

* CEC = Cation-exchange capacity. † TEB = Total exchangeable bases.

Further improvement must have accrued from the marked physical changes observed in the field and illustrated in the accompanying photographs, particularly the more friable soil texture and improved moisture penetration. The resultant transformation of a compacted soil of poor structure with a concentrated surface layer of organic material and plant nutrients into a deep, friable, moist topsoil with better distribution of nutrients may have induced the improvement in pasture production.

There remains the possibility, however, that the growth-promoting factor mentioned by Nielson (3 and 4) which is secreted in the digestive tract of the earthworm may have contributed much to the overall pasture improvement.

Summary

The beneficial effects of earthworms on soil fertility and pasture growth have been definitely established, but cannot be ascribed to any one direct or indirect factor.

Earthworms incorporate throughout the topsoil organic material and plant nutrients which would otherwise remain near the surface. They improve soil structure. They improve the water absorptive capacity of the soil, thus ensuring better utilisation of rainfall. They have been shown to excrete a substance which may stimulate plant growth.

The species *Allolobophora caliginosa* would not establish on unimproved Wehenga soils of low natural fertility (particularly low in calcium), but established and improved pasture growth by over 70 per cent on an area of the same soil type which had been improved by cultivation, resowing, liming, and topdressing.

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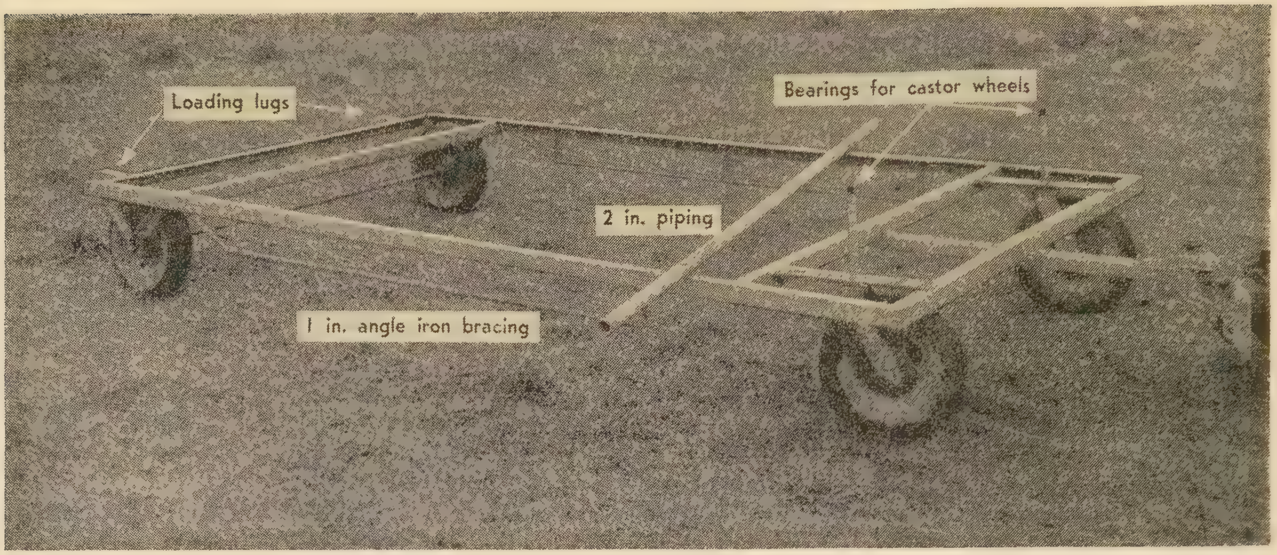
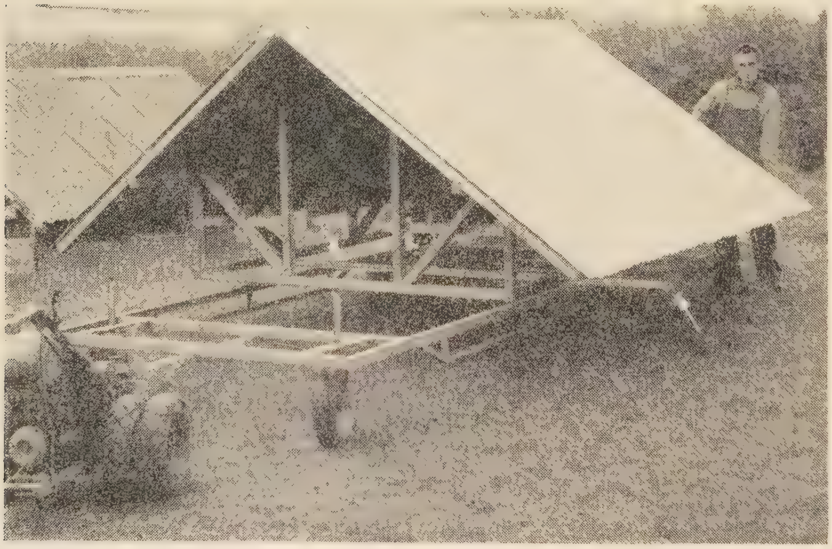
A Trolley for Moving Poultry Range Shelters



▲ The trolley is 10 ft. 6 in. long and 6 ft. wide. The supports for the castor wheel bearings are placed 9 in. from the inside edge of the angle iron on the side. A suitable tractor coupling is used to connect trolley to tractor.

By S. G. HADDON,
Poultry Instructor, Department of Agriculture, Auckland

FOR moving range shelters by the use of a double-wheeled tractor Mr M. Muncaster, a poultry farmer at Mangere, has had built an iron-framed trolley. By use of suitable couplings, etc., this trolley could be used with any tractor developing 5 or 6 h.p. or more. The complete trolley, made of 2 in. angle iron and fitted with four pneumatic-tyred wheels, cost less than £50, including all labour charges. A handyman would build a similar trolley for considerably less.



After one end of the range shelter has been placed on the loading lugs the shelter is rolled along the trolley on the water pipe (arrows).

THE trolley is basically a rectangular frame of 2 in. angle iron with a pair of wheels on an axle at the back end and two independent castor wheels at the front end.

Method of Loading

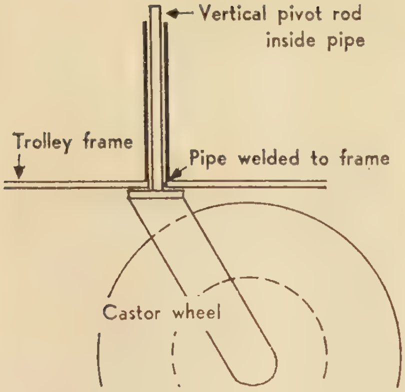
To load the trolley one end of the shelter is raised and the trolley run back under it; it is moved by hand very easily. The weight is taken by the loading lugs, which permit a 7 ft. length of 2 in. water pipe to be placed across the trolley underneath the raised end of the shelter. The rear end of the shelter is then raised and the whole shelter is rolled forward along the trolley until it is stopped by the two vertical castor wheel bearings. The whole operation is a one-man effort.

Unloading is simply a reversal of the procedure.

The dimensions of the trolley have proved very satisfactory, but are not critical and probably could be varied quite safely to suit special conditions.

Addition of Decking

Though Mr Muncaster developed his trolley primarily for moving his range

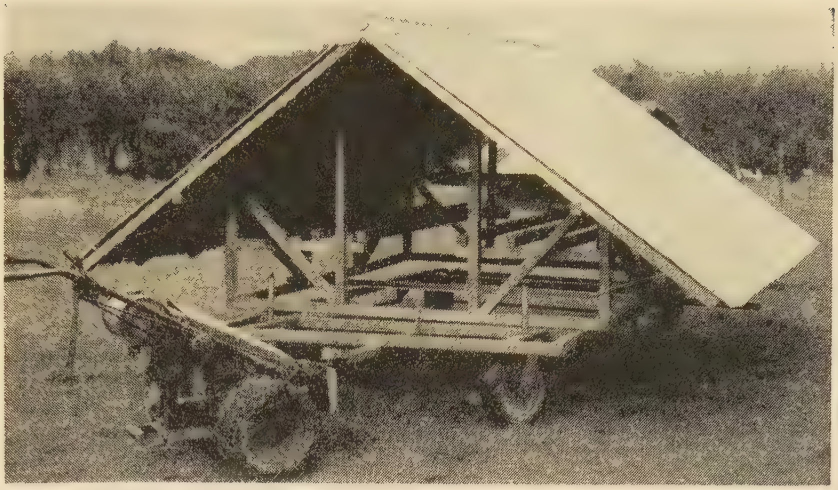

Vertical pivot rod inside pipe
Trolley frame
Pipe welded to frame
Castor wheel

The construction of the castor wheel bearings.

shelters, he is satisfied that the addition of a plain decking would increase its use and scope out of all proportion to its cost and so make it a most useful piece of equipment on any poultry farm. Mr Muncaster's farm is mainly flat, but there are some rolling paddocks.

All photographs by Sparrow.

TROLLEY FOR MOVING RANGE SHELTERS



The shelter completely on the trolley, the back end still resting on the pipe. The front end is tied down with cord to prevent movement during travel.

Portable Drinking System for Poultry

DRINKING water often has to be provided for large numbers of growing pullets in temporary quarters where existing drinking arrangements are inadequate or even non-existent.

The arrangement illustrated at right is portable, has a large reserve of water, and can be dismantled into three pieces for storage or transport.

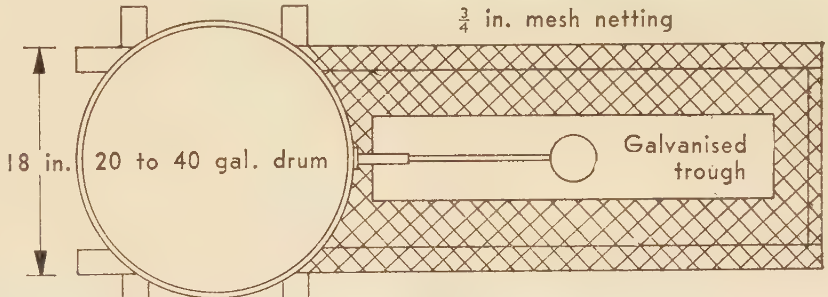
It consists of a drum complete with water outlet and ball valve, a wood and wire netting stand, and a drinking trough. The drum is filled by hose as required.

The size of the stand is not very important, but the base must be wide enough to allow 4 to 6 in. of netting each side of the trough.

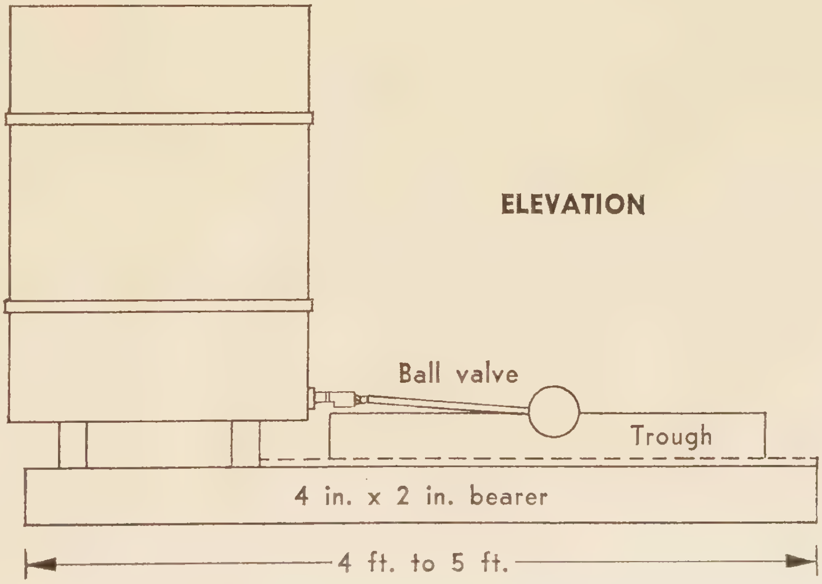
This precaution helps to eliminate a wet patch on the litter if the drinkers are used inside a large intensive shed.

This type of drinker has given good results when used inside a 40 ft. x 30 ft. intensive shed housing 900 growing pullets. Three drinkers were sufficient and were spaced conveniently about the floor. The sizes were approximately those shown in the illustration at right.

—*S. G. HADDON,*
Poultry Instructor,
Department of Agriculture,
Auckland

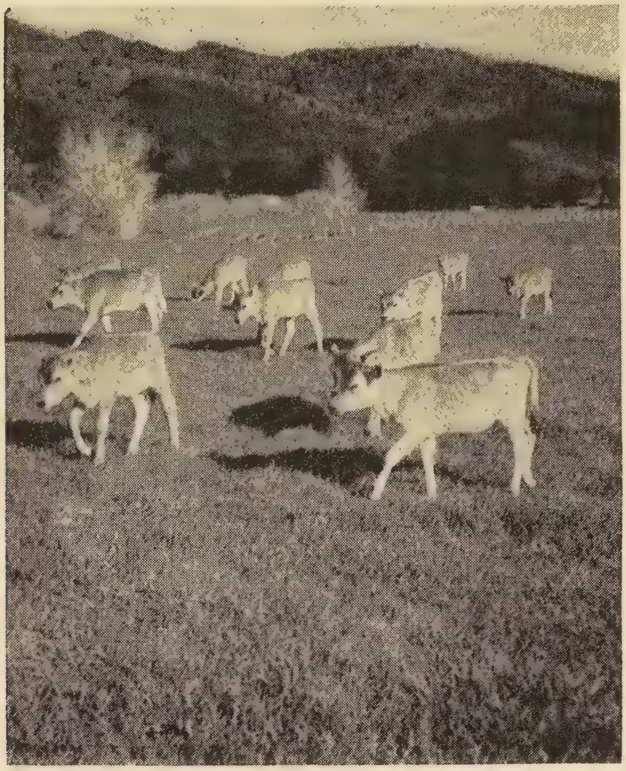

¾ in. mesh netting
18 in.
20 to 40 gal. drum
Galvanised trough

PLAN


Ball valve
Trough
4 in. x 2 in. bearer
4 ft. to 5 ft.

ELEVATION

Care of Livestock during April



[National Publicity

Contributed by the Animal Research Division

CARE OF CALVES

THE best way to prevent calves dying during winter is to treat them properly during autumn. They should never spend more than 2 or 3 days in one paddock and should be rotated ahead of the cows through the best paddocks available. Good hay should be provided for them daily, especially when the feed is growing fast after autumn rains. Set-stocked calves should be drenched with phenothiazine as soon as scouring is noticed.

DRYING OFF DAIRY COWS

A dairy cow requires a reasonable spell between lactations and should be dried off at least 6 weeks before she is due to calve. This should be done even if she is still milking heavily. The drying-off process need not be prolonged; it is quite safe just to stop milking, provided any quarters affected with mastitis are treated with the usual course of three tubes of penicillin, the last tube being given after the cow is milked for the last time.

AUTUMN-SAVED PASTURE

Early-calving cows are nearly always short of feed during July and August and often during September. In most seasons pasture is not growing fast enough during these months to meet the requirements of milking cows. Crops are expensive to grow and concentrates are even more expensive to buy. It costs nothing, however, to shut up pasture in the middle of April and let it grow for use in early spring. As much as possible of the dairy area should be shut up in this way.

Advice regarding the best paddocks to spell and the best method of feeding the autumn-saved pasture by the use of electric fences can be obtained from local officers of the Department of Agriculture.

On hill country, paddocks should be shut up for autumn-saved feed to be used by breeding cows and ewes before calving and lambing. Mob stocking makes this feasible on most hill country properties.

PURCHASE OF HERD SIRE

If a new herd sire will be required this year, now is the time to make inquiries. The New Zealand Dairy Board issues a Sire Survey and Merit Register which gives the production of the daughters of all dairy sires which have been surveyed. Unfortunately very few progeny-tested sires are available, but the Register should be consulted and wherever possible a bull by a proven sire out of a merit cow should be selected. Bull catalogues are issued annually by the Herd Improvement Association, and these, too, should prove of considerable value to dairy farmers who are looking for herd sires. The New Zealand Dairy Board is expanding artificial breeding commercially and farmers interested in making use of this service should get in touch with the local Herd Improvement Association.

CARE OF EWES

If rams remain with the ewes for more than 4 weeks, they should be raddled on the brisket so that the late-lambing ewes can be drafted off. Once the ewes are in lamb the level of feeding should be lowered to prevent their becoming too fat. If the rate of stocking is increased during autumn, some paddocks can be shut up and pasture allowed to grow for grazing during the 3 weeks before lambing. These measures will greatly assist in reducing "sleepy sickness", which is more prevalent in fat ewes which are inadequately fed just before lambing. Ewes well fed during the month before lambing produce on the average ½ lb. more wool per head than those which are underfed during this period.

CARE OF LAMBS

If summer and autumn have been wet, lambs are likely to be suffering from worms. Drenching with fine-particle phenothiazine two or three times at monthly intervals will help. This applies particularly to the tail of the flock, which should be drafted off for special attention. Feed, however, is the most important consideration. During autumn lambs do best if grazed on pastures which have been allowed to grow to a height of 4 to 6 in. Hay aftermath and clover are very good. If these are not available, the lambs should be distributed thinly over the dairy paddocks or on hill pastures. They should on no account be concentrated in large numbers on short, rapidly growing pastures, especially if these have previously been grazed by ewes and lambs.

DECEMBER-FARROWED PIGS

Litters farrowed in December should be sold as pork. If they are carried on to bacon weights, no milk will be available for the later litters, which will have to be sold cheaply as stores or wintered on expensive concentrates. Available root crops may be fed to sows, but they require supplementing with milk or meat meal.

TUBERCULOSIS IN POULTRY

Outbreaks of tuberculosis not only cause considerable loss in poultry but they frequently spread to pigs, with consequent condemnations at meat works. If this disease is suspected, veterinary aid should be sought to eliminate affected birds.

Pasture Production

Seasonal Notes by the Extension Division

A LARGE amount is spent every year on mole and tile drainage of farm land. The value received from this expenditure can be greatly reduced if the free movement of surplus water is restricted by lack of attention to outlets.

CLEARING DRAIN OUTLETS

MUCH of the success of underdrainage depends on the drain outlets remaining clear. If an outlet becomes permanently blocked, breakdown of the drainage takes place. For this reason it is good practice to place tiles at the end of mole drains and set the outlets of tile drains in concrete to protect them and reduce the ease with which they can be blocked.

All outlets should be inspected every autumn and cleared of mud, weed growth, and other obstructions. It is also a wise practice to inspect these outlets at frequent intervals throughout winter to see that they remain cleared.

Such inspections also afford an opportunity to observe the flow of water coming from the drains and note any irregularity in them which might be caused by a blockage or partial breakdown of the drain. The trouble may then be rectified before the drained area suffers.

Trees and such weeds as redshank (*Polygonum persicaria*), commonly called willow weed, will send their roots into tile drains and block them, and this is another reason for keeping a close watch on the outlets. Trees close to subsurface drains are better removed.

—*K. L. MAYO, Palmerston North*

* * *

SAVING THE AUTUMN FLUSH OF GRASS

THE importance of having ample saved grass for feeding to dairy cows in winter and spring until growth comes away properly has been demonstrated by research workers and proved by farmers in all dairying districts. A third of the farm shut in April-May used to be considered sufficient to carry the herd through from calving, but now it is recommended that two-thirds be shut and that the feeding of this grass should begin 2 to 3 weeks before calving.

To be able to shut up two-thirds of the farm by mid May, about a third should be shut in early April and a half by the end of April. This requires careful planning. In late February-early March three or four paddocks should be missed from the rotation so that by the end of March they will have extra grass that can be break fed to the herd, giving say 10 to 15 days' feed. This gives the opportunity of shutting up several paddocks which will not be grazed until mid June.

With a greater area being closed in autumn the area available for grazing during the last 4 to 6 weeks of the present season is of course reduced considerably. However, the experience of those farmers practising this system is that the production of the herd does not drop unduly, even though the rotation of paddocks being grazed is reduced to about a week. The grass can be supplemented by some good-quality silage as required.

This system of management is much simplified if an autumn crop is grown. Some farmers are adopting the practice of growing an extra autumn crop, either white fleshed turnips or chou moellier, and if this is available in early April, extra grass can be saved while the crop is being fed.

The essential factor in the success of saving the maximum area of autumn grass is to be able to shut the paddocks while they are growing vigorously. The winter and early spring grasses such as short-rotation ryegrass and prairie grass begin their new season's growth in early April as a rule, and if the paddocks are spelled, these grasses produce to the maximum, whereas if close grazing continues until well into May, much of the potential winter production of the grasses is lost. Research workers at the Department of Scientific and Industrial Research's Grasslands Division, Palmerston North, have shown that by shutting up paddocks of short-rotation ryegrass early in April and grazing in mid June and again in early August almost double the production is obtained compared with closing in early May and letting the pasture grow right through until early August.

—*A. C. BURGESS, Palmerston North*

* * *

NITROGEN FOR WINTER GRASS

NITROGENOUS fertilisers should be applied to pastures in good heart and which contain plenty of perennial ryegrass, short-rotation ryegrass, or other winter growing grasses. Drainage should be good; otherwise feed may be grown which cannot be grazed without being spoilt by poaching. Pastures to be treated should be well supplied with lime, phosphate, and potash.

If extra growth is required for feeding in June and July, the nitrogen should be applied early enough to allow several weeks of growth before winter. For best results applications should be made in the mild, showery weather usual in April. The normal cold and wet conditions in June tend to prevent a response to nitrogen, and July is the best time to apply it to provide extra feed in August. One hundredweight of sulphate of ammonia or its equivalent in other forms of quick-acting nitrogenous fertilisers is the usual dressing.

—*J. A. GRAHAM, Palmerston North*

* * *

DESICCANTS FOR RED CLOVER SEED CROPS

CROP desiccants can be used successfully for drying out the leaf and stem of red clover seed crops before harvest. The necessity for using desiccants is more apparent in Montgomery red clover, which is late maturing and presents difficulties at harvest time owing to the presence of a considerable bulk of green leaf and stem. This problem is not so evident in cowgrass (broad red clover), which is earlier in reaching maturity, and consequently dries out sufficiently for normal harvesting in most seasons. Within 3 to 4 days of applying these chemicals a seed crop of Montgomrey red clover is sufficiently desiccated to enable it to be harvested by direct heading. In this way the harvest can be brought forward by 8 to 10 weeks.

A number of commercial preparations are available, though experiments have shown that the most efficient desiccant for Montgomery red clover is a trade preparation containing dinoseb (DNBP) and dinosam (DNAP) as the active ingredients. The minimum rate of application per acre is 1 pint (.75 lb. of phenol equivalent) in 11 gallons of diesel fuel. A spray unit used with hollow cone nozzles at 35 to 40 lb. pressure and at a speed of approximately 4 m.p.h. should give the required coverage. This material is classed as a poison and operators must use protective clothing when using this chemical.

—*W. V. HADFIELD, Timaru*

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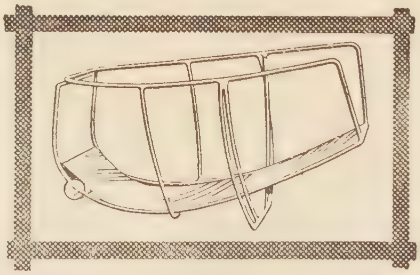

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The Home Garden in April

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

GROWING conditions in some localities may be very good in April, but even where conditions are favourable prospects are generally better for planting than for sowing, because the progressive shortening of the hours of daylight and the relative coolness of the nights are a forewarning of the approach of winter. A mild, sunny prolongation of late summer weather during April is especially appreciated by keen home gardeners, as good use can be made of favourable weather to complete the many routine garden tasks or to improve garden facilities or layout.

THE pods of dwarf and runner beans should be picked regularly before they are much more than half grown to encourage plants to continue bearing. Leeks should be earthed up as they develop if long blanched stems are wanted. Celery, too, should be blanched by being earthed up or by the use of suitable reinforced paper or boards along the sides of the bed as described in last month's home garden notes.

Frost can be expected in most districts in April, and the harvesting and storing of crops such as onions, kumaras, pumpkins, marrows, and squash should be completed before low temperature or frost damage occurs. Low temperatures should be avoided for kumaras, particularly if they are to be stored. Hard frosts are liable to damage plants such as pumpkins, marrows, squash, and even onions. Though the damage may not be apparent immediately, keeping quality may be affected.

Sowing and Planting

Sow

Onions	In well drained soils that are not too cold
Spinach	
Radish	
Carrots	A small sowing in districts where winter conditions are mild
Peas	In well drained, fertile soils in favourable situations toward the end of the month
Broad beans	In most districts

Plant

Cabbage	In most districts
Cauliflower	
Lettuce	
Silver beet	

Though generally the season of growth for tender and half-hardy crops such as marrows, pumpkins, cucumbers, and tomatoes is finished, steady growth can be expected from hardy plants such as those of the cabbage family, leeks, silver beet, and spinach. Few kinds of vegetables should be sown in the open at this time even in favourable districts, though hardy, quick-maturing vegetables such as spinach and radishes can be sown in most well drained soils that are not too cold. Vegetables such as cabbages, cauliflowers, silver beet, and lettuces should be set out in most districts, but seed should be sown only if the soil is well drained and fertile and the aspect and situation are favourable.

Cover Crops

Ground should be cleared and dug over as each crop is finished and the refuse put on the compost heap or dug in, and if the land is not wanted for several months, a green crop should be sown. Seed of crops such as lupins or mustard can be sown where temperatures are not too low. Elsewhere crops such as oats or barley can be sown.

Cover crops are valuable for digging in to increase the organic matter in the soil. They also take up soluble plant foods while they are growing and so prevent their loss by leaching. Fertiliser applied to a green crop will increase the organic matter in the crop and most of the plant food will be absorbed and held by the green crop and gradually made available to the succeeding crop as the green crop decomposes. The nearer to maturity a green crop is permitted to grow the greater will be the amount of organic matter available.

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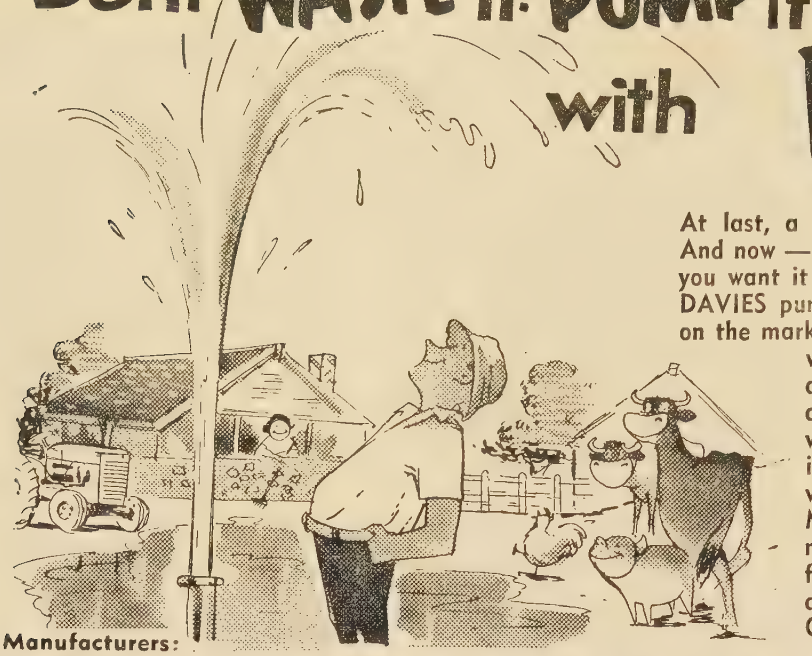

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[*Green and Hahn*

Land not to be used for some time should be sown in a cover crop. Barley is one of the most suitable crops for sowing now where temperatures can become fairly cool.

Asparagus

The fern growth of asparagus can be cut when it begins to turn yellow through the onset of cold autumn weather. The green top growth is the part which manufactures plant food and builds up crowns from which strong spear growth can be cut next spring. Cutting should not be deferred too long, as the seed may ripen and fall and the young plants which come up become established to the detriment of the bed.

Fern growth can be cut with hedge shears which have notched blades or with a sharp knife. The bed should be weeded afterward if necessary. The top growth is sometimes cut and left to dry and then burnt on the bed, but it is preferable to put it on the compost heap.

Carrots

Autumn sowing of carrots is not advisable where winter conditions are cold enough to check growth severely, but on light, well drained soils in favourable situations a small sowing of short or half-long carrots can be made in many districts in April.

Sowing on ridges or in a raised bed is usually an advantage, as drainage is better and soil temperature is higher. The rows on a raised bed need not be more than about 6 to 9 in. apart and for convenience in harvesting a bed should not be wider than 4 ft. Roots are usually harvested before they are fully mature, and thinning should therefore be unnecessary, though the rows should be kept free of weeds.

Celery

In most districts celery will have reached its maximum development by April and if it has not yet been blanched, that work should be done as advised in last month's home garden notes. In districts where a favourable growth period can still be expected self-blanching celery can usually be improved after the blanching material has been put in position by being watered with sulphate of ammonia or nitrate of soda at about 1 oz. to 2 gallons of water. This usually stimulates growth, causing elongation of the heart and leaf stems and improved texture.

Regular spraying as advised in last month's "Journal" should be carried out where celery leaf spot disease is troublesome and harvesting is not to be undertaken for some time. Leaf spot diseases spread rapidly in the moist conditions which often prevail in late autumn.

Kumaras

Home gardeners who grow kumaras usually leave the main crop to develop as long as possible, as kumaras gain in total yield and the table quality of mature tubers is better than that of immature ones. However, where tubers are to be stored digging should be completed before there is risk of low - temperature injury. When kumaras are mature enough for storage the skins should be reasonably firm. They can be tested by cutting, as when cut mature tubers dry rapidly and cleanly on exposure to the air.

The keeping quality of most varieties of kumaras is likely to be affected when the temperature falls to 40 degrees F. (8 degrees above freezing point) and long storage is usually inadvisable. For best results the tubers should not be subjected to temperatures below 50 degrees. If they are carefully harvested and properly cured and stored, it should be possible to keep them until next season's crop is ready, but if digging is delayed until

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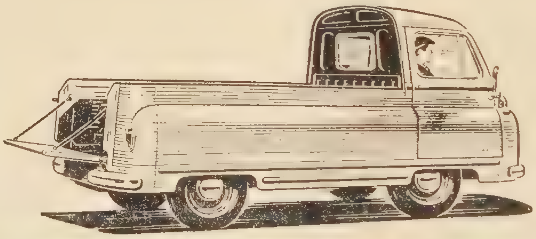

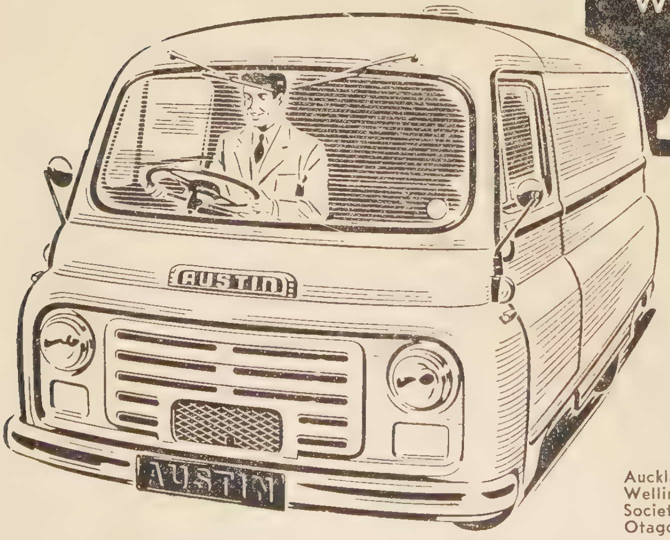

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after frosts and tubers are left for several days in wet, cold soil, loss during storage may be very high. Even a few days at 40 degrees may cause discolouration, and if the tubers are set to grow shoots for cuttings, sprouting is likely to be poor.

To ensure that their quality remains at its best from one harvest to another tubers should be handled with care. Badly damaged ones should be rejected and the remainder subjected to a period of fairly high temperature and humidity to cure them and enable wounds to heal. They should then be stored in conditions of scrupulous hygiene at a temperature of not less than 50 degrees and at 85 per cent relative humidity.

Proper curing of kumaras or sweet potatoes is as necessary as care in lifting and handling. In New Zealand curing of a kind is usually done by gathering the tubers into heaps and leaving them for about a week, keeping them covered during rain or at night with their vines or old sacks. Where temperatures are sufficiently high quite fair results are usually obtained with this method. By the time the tubers are ready for storage damaged ones which may have been overlooked have begun to decay and can be rejected. If tubers are to be properly cured in the field, they should be subjected to temperatures of not less than 70 degrees and fairly high humidity day and night for 4 weeks or more. Such long curing is not usually practical in New Zealand, however, because of the need to grow the plants for as long as possible. Curing for too long may also result in excessive sprouting.

In the U.S. sweet potatoes (kumaras) are cured in specially designed storage houses. Temperatures of 80 to 95 degrees F. are maintained for 10 to 14 days at high humidity. A temperature of 85 degrees and 85 per cent relative humidity provide about the best conditions.

Onions

Harvesting and curing of onions for long keeping should be completed as soon as possible as advised in last month's notes. The weather after April in most districts becomes progressively less favourable for drying and curing the bulbs and only sound, well formed bulbs which have been properly cured should go into long storage; others should be put aside for immediate use.

Small quantities can be strung or stored in open-mesh bags in a cool, ventilated shed or cellar, but because of the injury which often results when there is a heavy weight of onions in a bag it is advisable when storing considerable quantities of onions to use specially made slatted storage crates or to store them on slatted shelves. Onions should not be exposed to direct sunlight during storage, as it may promote early growth. If it is necessary to store them outside, a dry, sunless position where there is good air draught is desirable. The onions should be protected from rain and preferably placed on a structure far enough above ground to enable air to circulate under them.

A good method of drying onions. Only sound, well formed onions which have been properly cured should go into long storage.

Autumn Sowing

Though autumn sowing of main-crop onions is a fairly general practice in the North Island, it is rarely done in southern districts. In most northern districts late March or early April is considered the best time for autumn sowing. Onions if autumn sown in southern districts are not usually thinned, but are kept cultivated and grow on until about November or December, when they are used as "thick necks" without being encouraged to form large bulbs. In most northern districts, however, the plants are lifted in early spring and set out in rows 12 to 15 in. apart with the plants 4 to 6 in. apart in the rows.

Autumn-sown crops in some districts may not be successful and where winters are severe success depends to some extent on the season. Early frost will sometimes "lift" and damage the tiny seedlings of late-sown crops, whereas if the seed is sown too early or if a long period of mild weather precedes a very severe cold period, the plants may run to seed in spring before they have developed properly.

Though this is true of autumn sowing in general, in most districts in the north, where winters are less severe and mildew may be more troublesome on later-sown crops, the risks associated with autumn sowing and spring transplanting are not great. For autumn sowing the ground should be deeply cultivated and broken down to a fine tilth. It should be gently firmed, but care should be taken where the soil is heavy to avoid firming it too much, as the heavier soils tend to consolidate excessively where frequent winter rains occur.

If well rotted stable or farmyard manure is available, it is best incorporated some time before the final preparation of the soil is begun. Best use can usually be made of such manure by adding to it about a thirtieth of its weight of superphosphate and applying it to land on which the crop is to mature. If good-keeping onions are required, application in spring of excessive quantities of organic manure rich in nitrogen is undesirable, as the bulbs may be stimulated into excessive leaf growth and weed growth is liable to be more troublesome.

Most home gardeners find farmyard manure difficult to get, but available organic matter such as compost, plus a complete fertiliser applied at about 3 to 6 oz. per square yard, should be used. Because of variation in soils and their condition throughout New Zealand only local experience and knowledge can indicate fertiliser requirements, but if soil conditions are good and fertiliser is not placed too near the main root zone, heavy appli-

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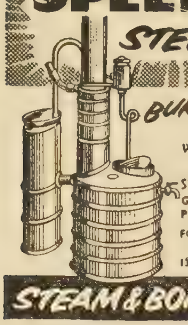

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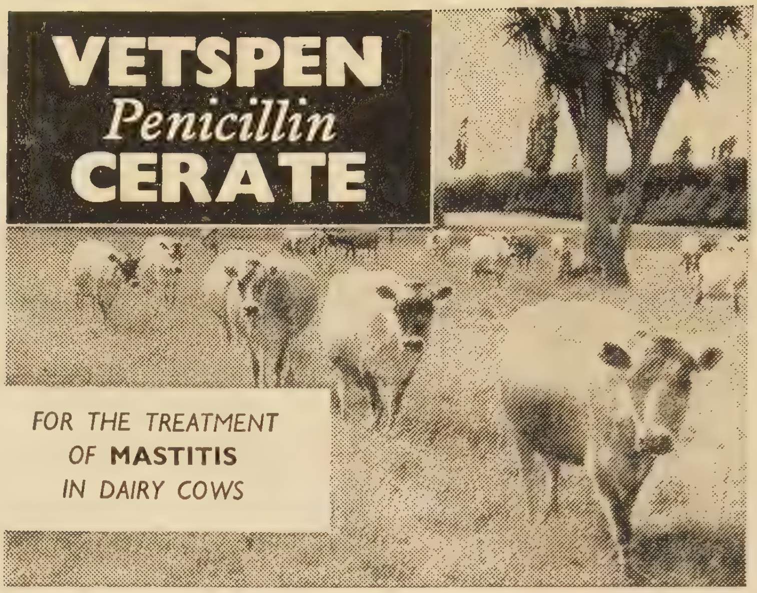

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[*Sparrow*

Most potato crops should be mature or nearly mature by the end of April. They are usually best dug when the tops begin to fail.

cations of fertiliser are usually desirable.

In general a fertiliser high in phosphoric acid but containing a liberal amount of potash and a smaller amount of slowly available nitrogen will give good results. The phosphoric acid and most of the nitrogen for early planted crops can be supplied conveniently by finely ground bone meal and the potash can be supplied by muriate or sulphate of potash.

The growing of onions on the same land for several years in succession is unwise where serious diseases are present, but otherwise has some merit, as several trials have indicated that production is likely to be higher on land where one onion crop succeeds another than where onions follow a different sort of vegetable. The practice of growing successive crops of onions in the same ground probably arose from recognition of the high fertiliser needs of the onion and consequently the desirability of maintaining an area of the garden very high in fertility and regarding it as the onion bed.

However, rotation is just as important in growing onions as in growing other crops where diseases to which the crop is specially subject have built up. In addition, most other vegetables grow well without further fertiliser on land that has received the heavy fertiliser applications usually given to onions.

Onion seed should be sown ½ in. deep at 10 to 20 seed per running foot in rows 12 in. apart in finely cultivated soil.

The growth of onions, unlike that of most other crops, is not usually seriously affected by moderate crowding in the rows, and provided the seed is not sown too thickly, thinning should not be necessary on most free-working soils. Good varieties of onions include Ailsa Craig and Straw Spanish for early crops, and Pukekohe Long Keeper for main crops and long storage.

Potatoes

Healthy potato tubers increase in size until the haulms die, and for maximum yield they should not be dug until then. Most potato crops should be mature or nearly mature by the end of April, and though it is not advisable to dig potatoes for long keeping until they are mature, digging should not be deferred if they have reached maturity. Where this is in doubt potatoes can be tested for maturity by digging one or two plants. The skins of mature tubers should be so well ripened that they do not rub off easily and are not readily scarred or bruised in handling. Potatoes dug a considerable time before full maturity are tender with easily broken skins that fluff and curl in fragments.

A number of diseases may cause potato leaves to appear scorched or to die prematurely. The common potato blight (late blight or Irish blight) causes dark brown to black irregular spots, which usually develop rapidly, on the leaves and stems. The decaying tissue usually has a noticeable odour and white mildewy growth is often present on the under sides of the affected leaves and stems.

Common potato blight can be controlled by spraying with Bordeaux mixture or copper oxychloride or one of the newer fungicides such as zineb, but the spray must be applied early and regularly. Most other diseases which cause potato leaves to become scorched or to die back affect the tubers or young shoots. They are numerous and some knowledge of the diseases affecting potatoes is needed to distinguish one from another, but control usually consists of good husbandry and growing clean (preferably Government-certified) seed in soil that is not known to be infected with diseases likely to affect potatoes.

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Spring Cabbage

If early spring cabbage is wanted, sturdy, well grown plants with good root systems should now be set out. Cabbage for spring use can be set out from early autumn until mid winter or even late winter, depending on climate and variety. April is a favourable month in most districts, because if good plants are set out then, they usually overwinter well and mature early or late in spring according to growing conditions.

If set out too early, plants may make soft growth and be damaged by winter weather. If set out very late, they may be late in maturing, or if conditions are severe, the crop may fail owing to disease or premature seed development, because the plants have not had time to become established before temperatures fall or because temperatures are too low. Where winters are severe cabbages planted late in autumn may not mature earlier and may be less satisfactory than plants set out in late winter or early spring.

The soil should preferably be rich in organic matter and in most home gardens dressings of organic manure such as farmyard manure, stable manure, compost, or a moderate dressing of fowl manure are advisable. If the soil has not been limed recently and there is a risk of its being acid, a dressing of 3 to 4 oz. of lime per square yard is advisable. Heavier dressings may be necessary on some soils in high-rainfall districts, but as the effectiveness of lime is in direct relation to the closeness of its contact with the soil particles, it should preferably be applied some time before planting. Distribution should be as even as possible and incorporation should be assisted by at least one forking over.

Though the manurial requirements of cabbages are heavy, care should be taken to distribute fertilisers or manures evenly, as young plants are liable to be checked if the roots come in contact with too heavy concentrations of manure. Where organic manures such as farmyard, poultry, or stable manure, old stack bottom, or compost are not available a green crop should be dug in, and, except where the soil is very rich, the organic manure or green crop should be supplemented by a complete fertiliser containing nitrogen, phosphoric acid, and potash at about 2 to 5 oz. per square yard.

Additional side dressings of nitrogenous manures such as nitrate of soda or sulphate of ammonia are often advisable, particularly where the organic matter applied to the soil is strawy rather than sappy and well rotted and when quick, forced growth is required, as in early spring.

Flower of Spring and Enfield Market are popular spring varieties in most districts. Triumph has given good results in many districts and a number of other very useful varieties are listed in most good catalogues.

[Green and Hahn

Winter cauliflowers, which can be planted now, should have strong leaves encircling and protecting the curds.

Spring Cauliflower

The requirements of cauliflowers are similar to those of cabbage, except that cauliflowers are more sensitive to adverse conditions such as extremes of heat and cold, wetness and dryness, or cold winds. If checked, they are likely to "button" (form only useless, miniature heads). Frosts will damage the curds, and injury so caused is likely to permit the entry of soft-rotting organisms. Cauliflowers should, therefore, be planted out only in districts where winter conditions are not too severe. In unfavourable situations planting is best deferred until late July, August, or even September.

Good hardy varieties of cauliflower suitable for planting now are Walcheren, All Seasons (All Year Round), and Early London.

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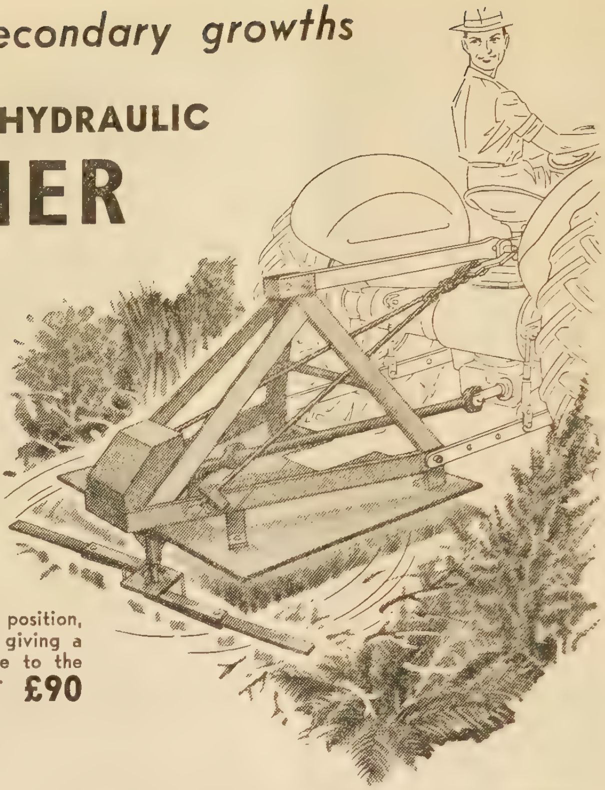

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Improved Method of Using Nursery Tree Wrencher

A NURSERY tree wrenching implement used in several Auckland nurseries was described in the April 1954 issue of the "Journal of Agriculture" by N. J. Hiam, Horticultural Inspector, Department of Agriculture, Auckland, who in this article explains a much improved system of operating this implement.

WHEN this implement and its operation were previously described only two or three were in use. Since then most of the larger fruit tree and rose nurserymen in the Auckland district have begun using similar implements.

There has been very little change in the wrencher itself, which is a simple sledge-like contrivance consisting of two angle-iron skids connected by a blade which curves to the depth below ground level at which the roots are to be cut (see Fig. 1). The width of the blade can be varied for different trees, but for fruit trees and roses the width between the skids is usually about 2 ft. and the depth of the cut about 1 ft. The cutting edge of the blade varies on different models, sometimes being curved (Fig. 2), or parallel with the back edge as shown in Fig. 1. Both types are quite successful. In certain types of weed growth a skeith fitted in front of the blade as shown in Fig. 2 has been successful.

The implement is drawn by a winch on which is wound 5/16 in. or $\frac{3}{8}$ in. wire cables extending the full length of the nursery rows. In the original method of operation the tractor wheels were lifted clear of the ground and the cables wound on to drums or tyre rims which were bolted to the wheels. Thus the tractor was used as a winch.

New Method of Operation

This method is being replaced by a system which uses the back axle, differential, and gear box of a car or light truck. These are mounted on an angle-iron frame which is bolted to the rear axle fittings of the tractor and, being driven by the power take-off, act as a winch (Fig. 3). The converted

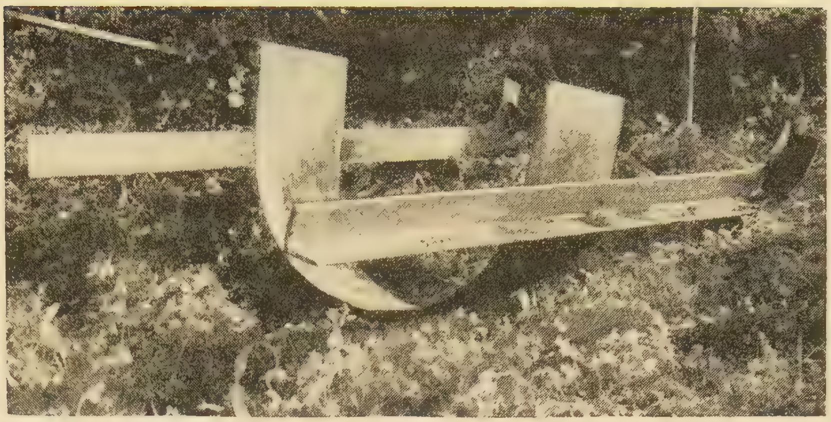

Fig. 1—The wrencher consists of two skids connected by a curved blade for cutting roots.

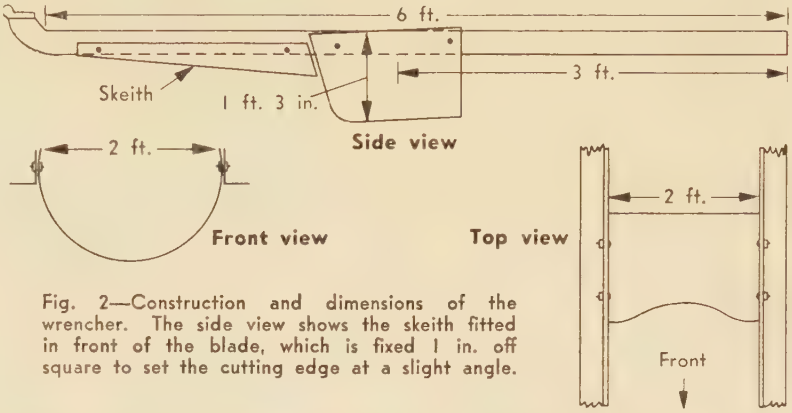

Fig. 2—Construction and dimensions of the wrencher. The side view shows the skeith fitted in front of the blade, which is fixed 1 in. off square to set the cutting edge at a slight angle.

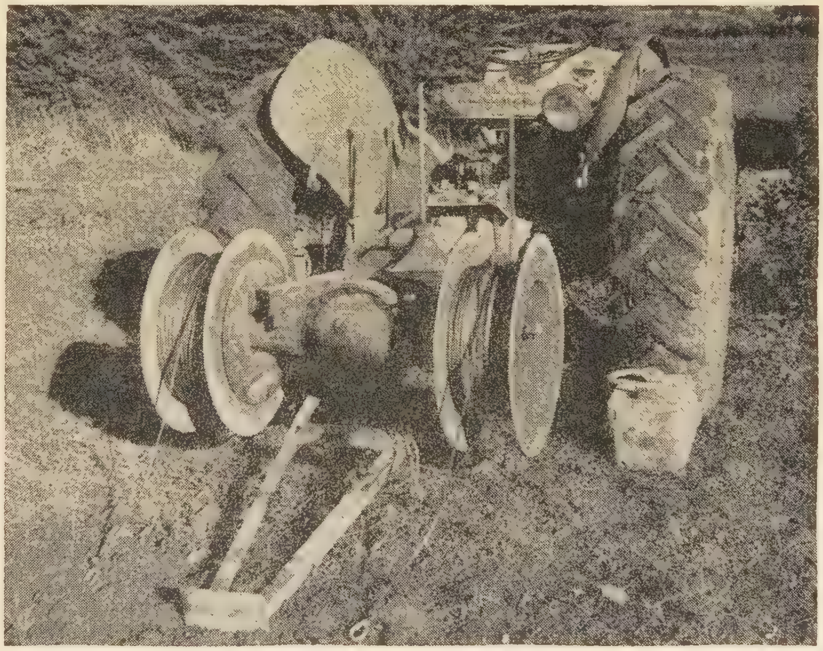

Fig. 3—The winch fitted on the rear of the tractor.

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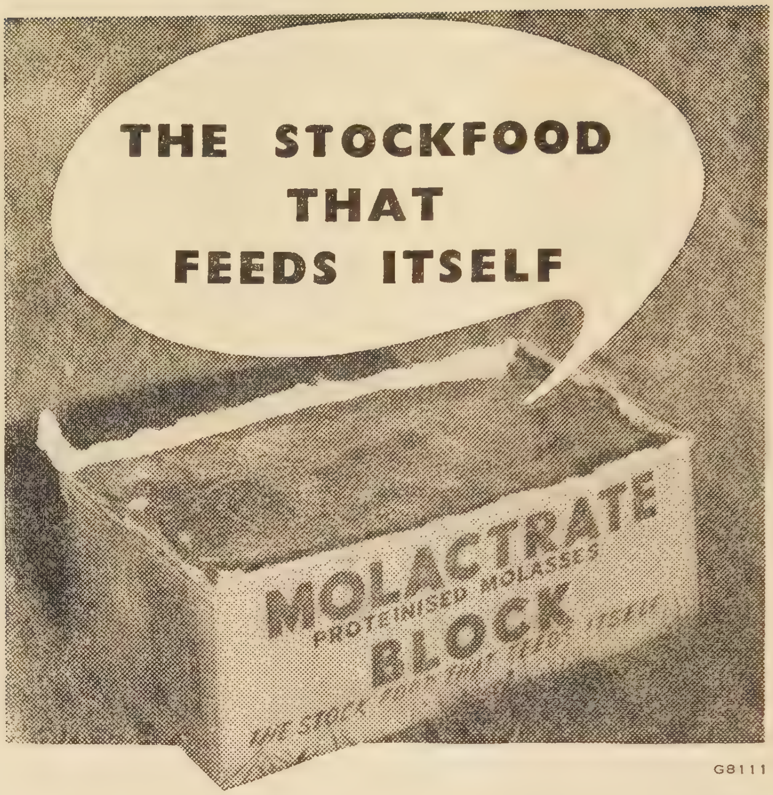
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back axle wheels are replaced with drums with flanges large enough to take the length of cable used. It has been found necessary to include the gear box in the unit to reduce the speed of the winch. A universal joint is fitted on the drive shaft between the power take-off and the gear box.

The brakes are retained and made so that they can be applied independently, usually by hand-operated levers, and are used to stop either one cable or the other should the digger pull to one side. Usually two men follow the digger and, with spades, keep any weeds from gathering in front of the blade. Hand signals are given to the operator at the tractor to guide or stop operations.

There are two methods of operating the unit satisfactorily.

The first is by a direct pull from the winch with the tractor backed up to the end of the rows. With this method it is necessary to reduce the width between the winch drums to about the width of the nursery rows by shortening the axles.

So that the minimum headland space is taken up it is necessary to make the drive both between the power take-off and the gear box and between the gear box and the adapted differential as short as possible. Thus, the overall length of the unit, including a small tractor can be reduced to about 12 ft.

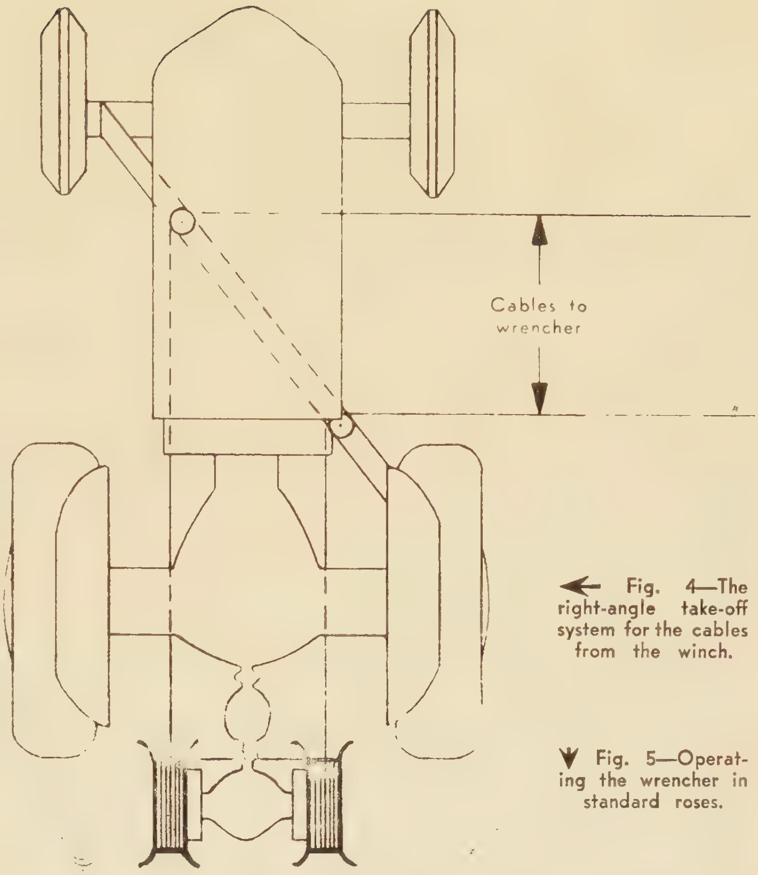
Fig. 3 shows clearly the method of holding the tractor. Usually the chocks placed behind the wheels will stop any movement, but the central sprag hinged on the frame which carries the winch is an additional anchor which is sometimes necessary.

The second method of operating is by running the cables from the winch underneath the tractor and through two pulleys so that they then take off at right angles to the tractor. This method can be used with minimum headland width, as the tractor is side on to the rows, and a further advantage is that lining up with rows is much simpler, the tractor having to be driven only the few feet to the next row.

The method of attaching the pulleys underneath the tractor will vary with different tractors, but this has not been found difficult, as all that is necessary is for two pulleys to be mounted in the correct positions on the framework (Fig. 4).

Both methods operate smoothly and efficiently and the time taken in wrenching large trees is only a fraction of that taken with spades. It has also been found that roots are cut cleaner and to a more even length than with spade digging, and there is less damage to plants such as bush roses.

All photographs by Sparrow.



← Fig. 4—The right-angle take-off system for the cables from the winch.

↓ Fig. 5—Operating the wrencher in standard roses.

Encouraging Results Obtained from

Use of Selenium for White Muscle Disease in Lambs

By C. DRAKE, Scientific Officer, A. B. GRANT, Principal Scientific Officer, and W. J. HARTLEY, Pathologist, all of the Department of Agriculture Animal Research Station, Wallaceville

IN the past lambing season serious losses were experienced from white muscle disease in lambs in many areas of the South Island. In previous years most of the losses occurred in lambs between 3 and 6 weeks of age, but this year in addition there were widespread losses, particularly in Central Otago, from a congenital form of white muscle disease. Affected lambs were either born dead or died within 2 or 3 days of birth, with severe changes in the heart and sometimes also in the limb muscles. A further feature of the outbreaks seen in Otago was the associated high incidence (up to 50 per cent) of empty ewes.

IT has been known for many years that vitamin E deficient diets have been associated with muscular diseases and reduced fertility, particularly in small laboratory animals. For this reason vitamin E in the form of alpha-tocopherol acetate has been widely used in New Zealand for the treatment of white muscle disease in lambs. No controlled field trials have been carried out, but affected lambs appear to benefit from alpha-tocopherol acetate therapy. Unfortunately dosing the pregnant ewe with alpha-tocopherol acetate will not prevent white muscle disease occurring in the lamb.

New Zealand Trials

Recent work in the U.S. has shown that selenium can replace vitamin E in certain deficient diets. Following on this report Wallaceville workers in cooperation with Veterinarians and Livestock Instructors have carried out limited selenium trials on properties in the South Island where white muscle disease occurred.

Lambs on 16 properties were divided into three equal groups at docking. One group received 1 milligram of selenium (as sodium selenate), one group received 300 milligrams of alpha-tocopherol acetate, and the third group received no treatment. On seven properties the selenium and alpha-tocopherol acetate were given as one injection; in the remainder these agents were given by mouth weekly until the lambs were from 2 to 3 months old. White muscle disease appeared on 11 of the properties, but in no instance were there severe outbreaks. The table shows quite clearly that vitamin E had some effect in controlling white muscle disease, while selenium almost completely prevented it.

CASES OF WHITE MUSCLE DISEASE

Selenium groups	Vitamin E groups	Controls
2	21	50

Very recently workers in the U.S., under carefully controlled experimental conditions, have shown that selenium supplementation of the diet of the pregnant and lactating ewe will prevent white muscle disease appearing in the lamb.

Future Trials

This year, in addition to carrying out further controlled selenium dosing trials in lambs at docking, it is also intended to investigate the effect of selenium in reducing the high incidence of empty ewes on white muscle disease properties and in reducing or preventing the pre-natal and post-natal forms of white muscle disease.

It is also hoped to carry out controlled treatment trials in which selenium and vitamin E will be used on lambs affected with white muscle disease.

Farm Use of Selenium Not Yet Recommended

The initial trials using selenium in the control of white muscle disease are most encouraging. The amount of selenium that has been used to control white muscle disease is extremely minute, but there is another point that needs very careful watching. Not very much more selenium than is needed to cure the disease will be poisonous to sheep. A great deal more laboratory and field investigation will be required before it will be possible to define more accurately a dose rate of selenium that is practicable, safe, and effective. Farmers and veterinarians are therefore recommended in the meantime to continue to treat cases of white muscle disease with alpha-tocopherol acetate.

Book Review

"Soil and Agriculture of Oroua Downs, Taikorea, and Glen Oroua Districts, Manawatu County": J. D. Cowie and B. A. J. Smith

THIS, Bulletin 16, is the most recent addition to the bulletins published by the Soil Bureau of the Department of Scientific and Industrial Research giving details of soils of a particular area.

The bulletin deals with a portion of the sand country, which covers approximately 210,000 acres, on the west coast of the North Island. After describing the district covered by the survey Cowie deals briefly with the topography, vegetation, and climate of the area. The classification and utilisation of the soils are covered as well as problems associated with their present utilisation. There are also sections on horticulture, soil erosion, and the chemical analysis of the soils.

The agricultural notes were contributed by B. A. J. Smith, Fields Instructor, Department of Agriculture, Hawera.

These bulletins contain much information of interest to farmers and are particularly valuable to anyone contemplating the purchase of land in a locality covered by a survey.

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Paint Spray Gun for Spraying Glasshouse Crops

TOMATOES grown under glass require regular spraying at short intervals to keep the plants free from fungous diseases and insect pests. Application of sprays by a paint spray gun is a convenient, effective, and time-saving method which has been tried out over two seasons at the Department of Agriculture's Horticultural Research Station, Levin. Equipment installed in glasshouses at the Station is described in this article.

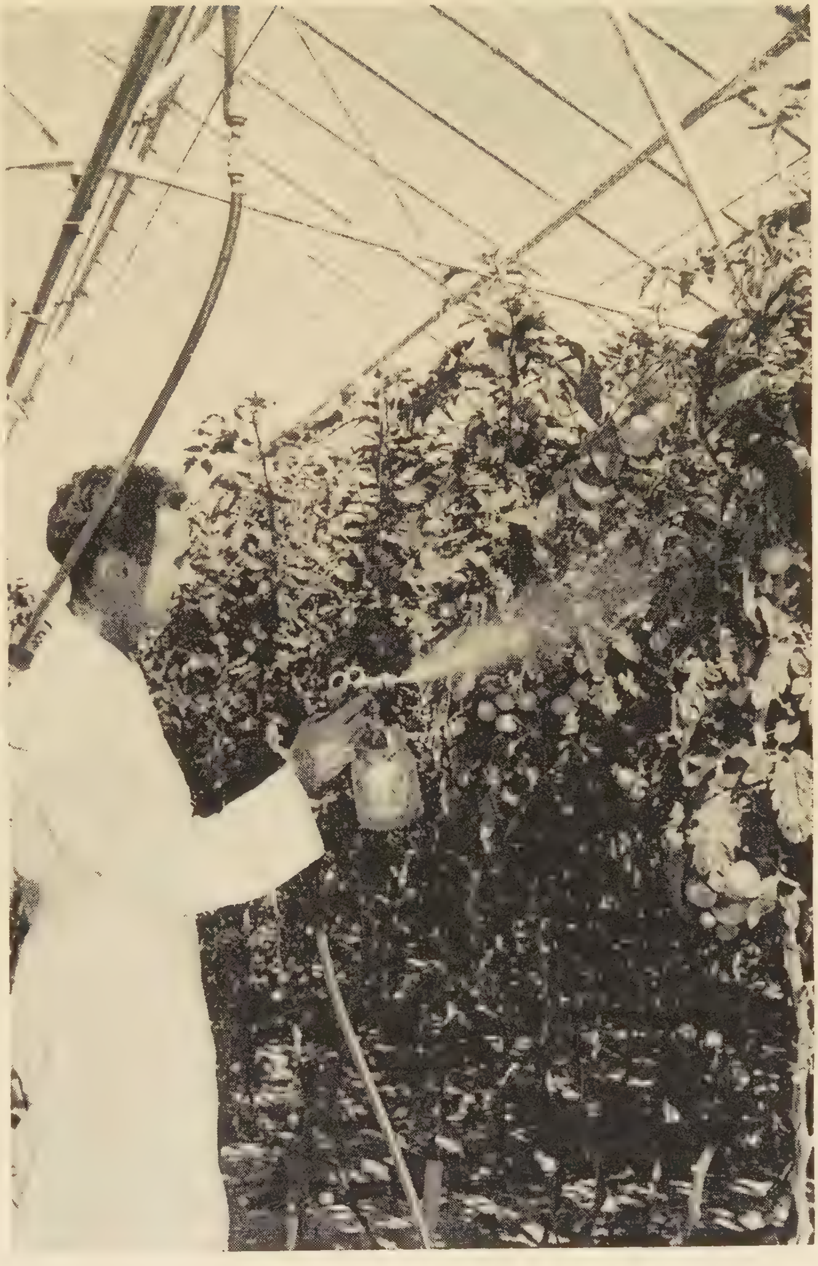
By W. R. BOYCE, Superintendent, R. H. GALLAGHER, Mechanic, and G. N. J. GOLDIE, Technician, Department of Agriculture's Horticultural Research Station, Levin

WARMTH, high humidity, and restricted ventilation in glasshouses provide conditions favourable for a very rapid build-up of fungous diseases on susceptible plants. Leaf mould (*Cladosporium fulvum* Cooke) and grey mould (*Botrytis cinerea* Fr.) are two common diseases of glasshouse tomato crops which, if unchecked, can cause severe losses. Though some control can be attained by good management practices in adjustment of temperature and ventilation, attention to glasshouse hygiene, and the use of varieties resistant to leaf mould, regular spraying for prevention and eradication of diseases and pests is essential if high yields and good fruit are to be obtained.

Spraying at 10- to 14-day intervals throughout a season of 6 months can be time consuming and expensive. Knapsack spraying in confined spaces between rows of plants is tedious and good coverage is difficult to obtain. Spraying machines are costly, cumbersome in confined spaces, and may require more than one person for handling and operation in a glasshouse. Paint spray guns are easy to use, give a good coverage, and reduce the time spent on spraying. Equipment can be installed at moderate cost, particularly where a grower can do the work himself.

A paint spray gun uses the principle of low-volume semi-concentrate spraying in which finely divided droplets of spray material are carried to the plant in a stream of air.

Because by this method air is used instead of water as the main carrier for the therapeutant material, much less water is needed in the spray mixture than when spraying by a knapsack or high-pressure pump.



Spraying plants with the paint spray gun. Spray particles, which are very fine, are seen only in direct sunlight, the cone of spray being more widely spread than the photograph shows. The operator moves between the rows of plants, sweeping the gun to cover the foliage and fruit with a fine, almost invisible film of particles.

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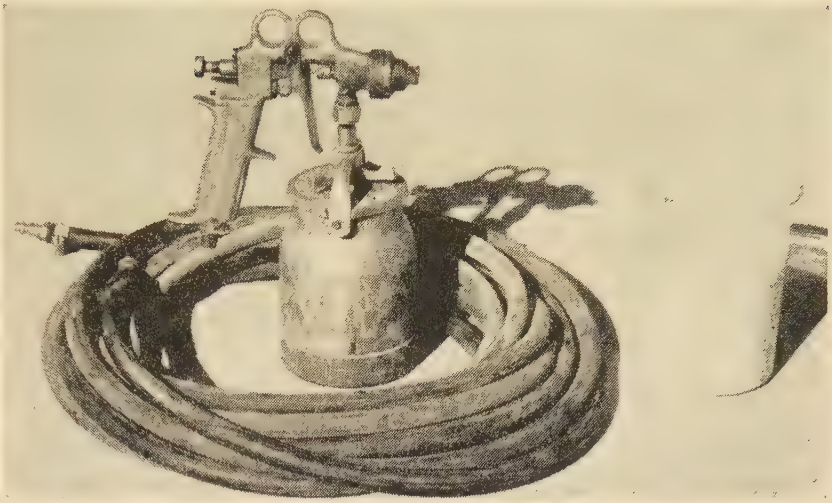
16.7a

Generally with a knapsack or high-pressure pump from 40 to 60 gallons of spray mixture are applied per 1,000 tomato plants under glass (when these are nearly fully grown), whereas from 1 to 2 gallons of spray have given adequate coverage when applied by the paint spray gun.



Left—The paint spray gun used to apply fungicidal and insecticidal sprays, with 40 ft. of high-pressure hose for connecting it to the air line. Right—Filtered spray mixture in a clean container.

Theoretically the same amount of therapeutant material is required per 1,000 plants whether it is diluted in 40 to 60 gallons of water for application by a knapsack or high-pressure pump, or in 1 to 2 gallons for application by a paint spray gun. However, in practice it is found that only half the amount of therapeutant material is required when the paint spray gun is used. This is probably because there is not the loss of material which occurs through run-off when spraying with a knapsack or high-pressure pump.

Good control of fungous diseases has been obtained with the smaller quantity applied by paint spray gun, probably through better and more even coverage. No plant damage has resulted at the Station with paint spray gun applications at 10 times normal concentration of any of the therapeutants used.

Most sprays when applied in very fine, mist-like droplets from a spray gun leave no conspicuous deposit on foliage or fruit. The operator must become accustomed to this difference in comparison with high-volume methods. The surface of leaves may be checked with a hand lens after a spray gun application. This reveals a fine even deposit over both surfaces, if the gun has been properly used. If drops form on the foliage or residues are conspicuous with a paint spray gun, too much is being applied. Elimination of run-off when a gun is used means that most of the spray material is remaining on the plant and providing more efficient protection.

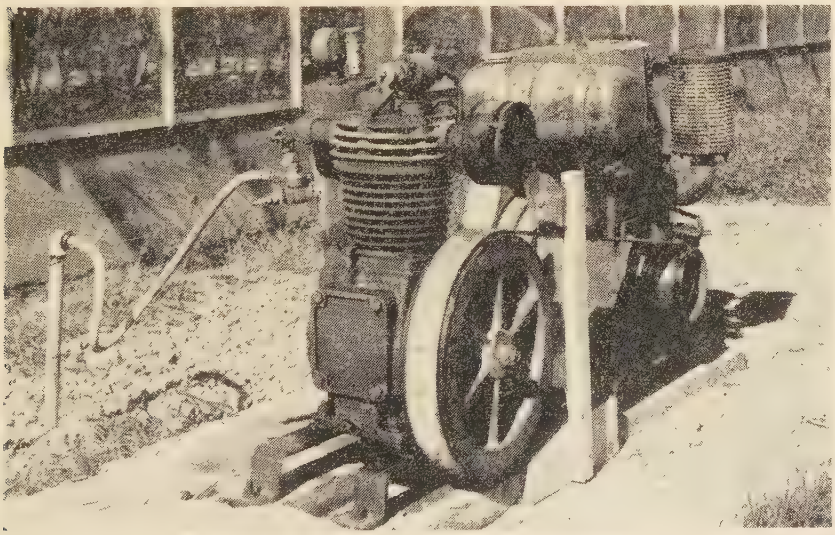
Installation

At the Station an air compressor supplies compressed air to an air line of ¾ in. galvanised piping. Leads are taken to two glasshouses 102 ft. long, and the lines run overhead in a convenient position for the full length of each house. Six plug-in couplings are provided at intervals in the air line. From these couplings a lead of 40 ft. of pressure hosing is sufficient to reach the sides of the house at any point.

Air cocks are provided at the entrance to each house. Though very little air is lost through leakage at the couplings, more even pressure is maintained when only one house is supplied at a time.

Compressed air is supplied to the lines at a pressure of 100 lb. per square inch and thence to the gun. The pressure-release valve in the compressor maintains an even pressure in the line and the supply of air to the nozzle is controlled by the trigger on the gun.

The air line, which is shown in the illustration on page 259, is for a house planted crosswise with a centre path. As an alternative to an air line a portable compressor may be used.



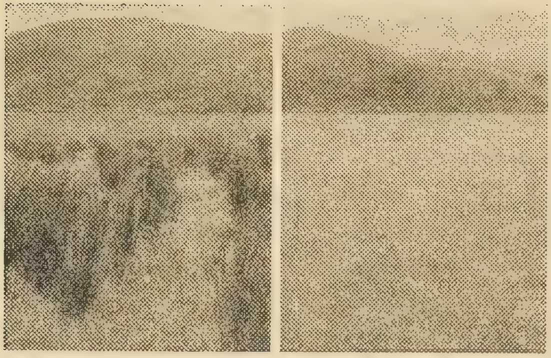
The air-compressor unit was first driven by a petrol engine and supplied air at 100 lb. per square inch pressure to the air line of ¾ in. galvanised pipe leading to the glasshouses. (The petrol engine has been replaced by an electric motor since the photograph was taken.) Two air valves are attached to the pressure tank of the compressor. One controls air to the air line and the other is used for releasing pressure on the compressor for starting the motor and for inflating vehicle tyres.

Equipment

Air Compressor

The single cylinder compressor used at the Station has a rated capacity of 17 cub. ft. of air per minute at 750 revolutions per minute with a maximum pressure of 150 lb. per square inch. The 5 h.p. petrol engine first used has been replaced by a 3 h.p. electric motor with a V-belt drive to the compressor. The compressor is fitted with a pressure-adjusting valve. A pressure-release valve and a pressure gauge are fitted to the small pressure tank. Because of the small size of this pressure tank ¾ in. pipeline was used as an additional reservoir. With a compressor fitted with a larger air-pressure tank a ½ in. air line would probably be satisfactory. A short length of pressure hose connects the

RUSHES WIPED OUT—pasture thrives after spraying with Shell Weedkiller "D"



Valuable grassland (however heavily) infested with common rush (juncus effusus) should be treated with Shell Weedkiller "D" in early summer. This photograph shows the difference between a four months unsprayed area of infestation, and clear, rich pasture with no signs of regrowth. Permanent clearance is mostly dependent on after-spraying management practices, the most important of which is adequate drainage.

Shell Weedkiller "D" is undoubtedly the most effective and least expensive method yet developed of controlling rushes in grassland and pastures. The common rush (juncus effusus) is most susceptible of all, and can be eliminated by spraying with Shell Weedkiller "D" in 25 gallons of water per acre. Other rushes should be mown early in the season and allowed to grow 3 or 4 months, or 1 foot high, before being sprayed. *After spraying, rushes take 2 or 3 months to rot.*

NOTE: Where general—but not intensive—weed control is required, Shell Weedkiller "D" is a low cost substitute for Shell Weedkiller "E" in pastures and for Shell Weedkiller "M" in cereals. It is fast in action, requires no pre-mixing and is suitable for either high or low volume application.

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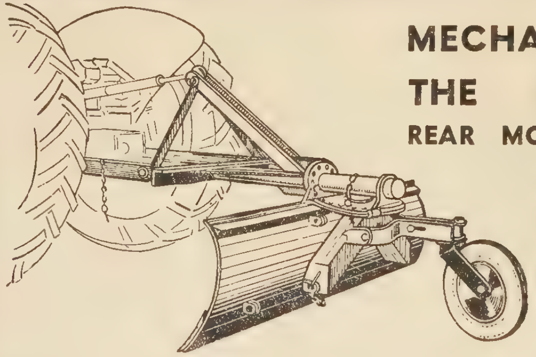

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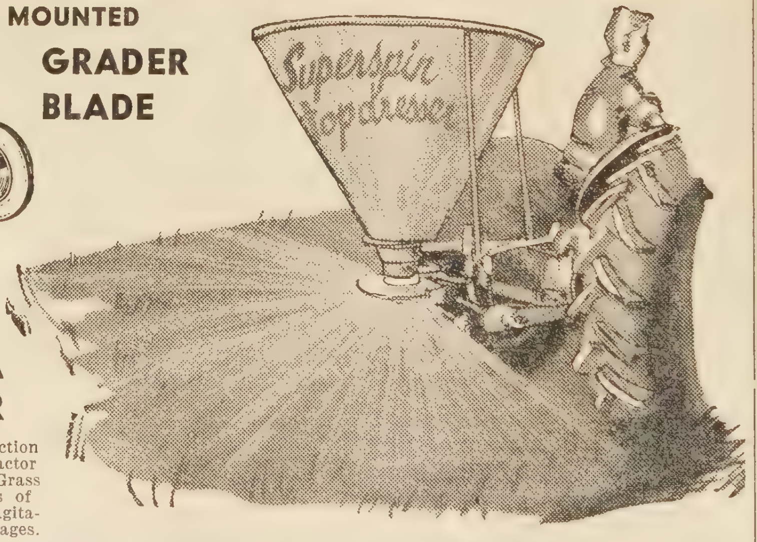

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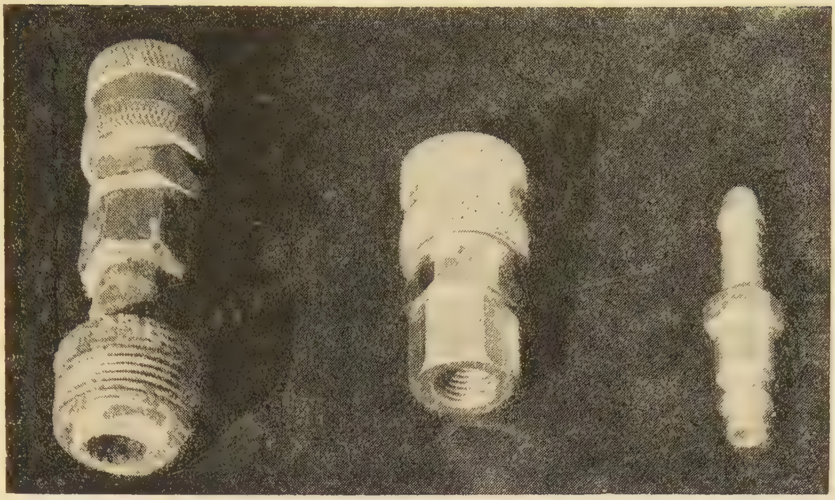

Coupling and air-line attachments. Right—The coupling's male unit the upper end of which fits into an air hose. The lower end plugs into the female unit (centre) to give an airtight linkage. The female unit's lower end, with ¼ in. gas thread, is shown at left screwed into the air-line attachment, which consists of a ¾ in. galvanised plug with ¼ in. drilling through the centre and which is welded to or threaded to take a ¼ in. barrel union.

air cock on the pressure tank to the air line by a plug-in coupling. A second air cock on the pressure tank can be used for tyre inflation or for the release of compression on the compressor unit.

A second-hand 350 c.c. o.h.v. motorcycle engine can be converted for use as an air compressor quite easily and cheaply. The head of the cylinder is removed and replaced by a ⅜ in.-thick, flat steel plate, set into which are two automatic valves, an inlet and an outlet. From the outlet, air under pressure is supplied to a small pressure tank to reduce pulsation and thence to the air line. An electric motor of ½ to 1 h.p. would be required to drive a compressor of this type. One such compressor unit is known to be operating successfully with a paint spray gun installation.

Couplings

Standard ¾ in. galvanised pipe and fittings are used for the air line.

Quick-release self-sealing couplings to the air line are fitted as follows: Three-quarter inch galvanised plugs are drilled through the centre and tapped to take a ¼ in. barrel union with gas thread. The female unit of the coupling is screwed to the other end of the barrel union. This assembly consisting of the female coupling unit, barrel union, and plug may then be screwed into a T piece or other convenient attachment on the air line.

The male portion of a coupling is attached to the air hose, which is then easily and simply plugged into the air line as shown in the illustration on page 259. To release the hose a knurled sleeve on the female coupling is pushed back and the hose comes free. Both operations can be done by the operator with one hand while he holds the hose and gun with the other. This makes for speed of working in the house.

Spray Gun

A standard pattern paint spray gun is used. It need not necessarily be a new gun. One which has been discarded for paint spraying can be perfectly satisfactory for therapeutant work, provided that the working parts and seals are in good order.

A most important point for satisfactory operation of the gun is adequate filtering of the spray to remove particles large enough to block the fine orifices and jets. A gauze filter with 100 meshes to the inch or several thicknesses of a nylon stocking are satisfactory.

Spray Materials

The materials listed in the table at right have been used with satisfactory results at the Station.

Thiram and salicylanilide are used as routine sprays at 10- to 14-day intervals for prevention of grey mould and leaf mould respectively. These two sprays may be combined, or applied in alternate sprayings if there is no serious build-up of diseases. DDT is applied as a separate spray at 30-day intervals or when required to combat insect attack.

For more detailed information on spraying or specific problems of disease control the local Instructor in Horticulture should be consulted.

Method of Application

Air-line pressure is adjusted to 100 lb. per square inch at the compressor. The operator plugs into the air line and moves down the rows sweeping the spray from ground level to the tops of the plants with a brisk movement. The foliage is ruffled by the jet from the gun. This improves the coverage on stems and on the under sides of leaves. It may have a beneficial effect in improving setting. As the plants are shaken by the air stream pollen is released from the flowers not directly in the spray. This is equivalent to the effect obtained by tapping wires or flower trusses.

In the first trials lower pressures of 30 to 40 lb. per square inch were used with much less satisfactory results. There was a poorer cone of spray and the jets blocked frequently. No damage to plants appears to result from the use of higher pressures.

Preliminary trials with a gun are recommended so that the best settings of jets, cone of spray, and air supply may be obtained. These settings may require alteration for spray solutions which differ greatly in density.

Time Required

A 100 ft. by 30 ft. house with 1,000 plants up to the wires can be sprayed in 40 minutes with a spray gun. This is less than a third of the time required when a knapsack sprayer is used. The saving in time should make it easier for a regular spraying schedule to be followed in the busier part of the season. Neglect of spraying through pressure of other work can result in a rapid build-up of disease in commercial glasshouses.

LOW VOLUME SPRAYS FOR PAINT SPRAY GUN APPLICATION

Fungicide	Active material	Quantities used	Dilution	Diseases
	per cent			
Thiram	50	3 oz.	Each in 1 gallon of water	Grey mould
Salicylanilide	25	10 fl. oz.		Leaf mould
Captan	50	3 oz.		Alternative to thiram above
Copper oxychloride ..	50	8 oz.		Late blight
*Zineb	65	3 oz.		Late blight
Insecticide				**Insect pests**
DDT wettable powder	50	2 oz.		Caterpillar; stem borer

* Not recommended for young plants

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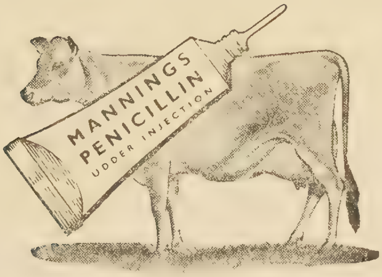

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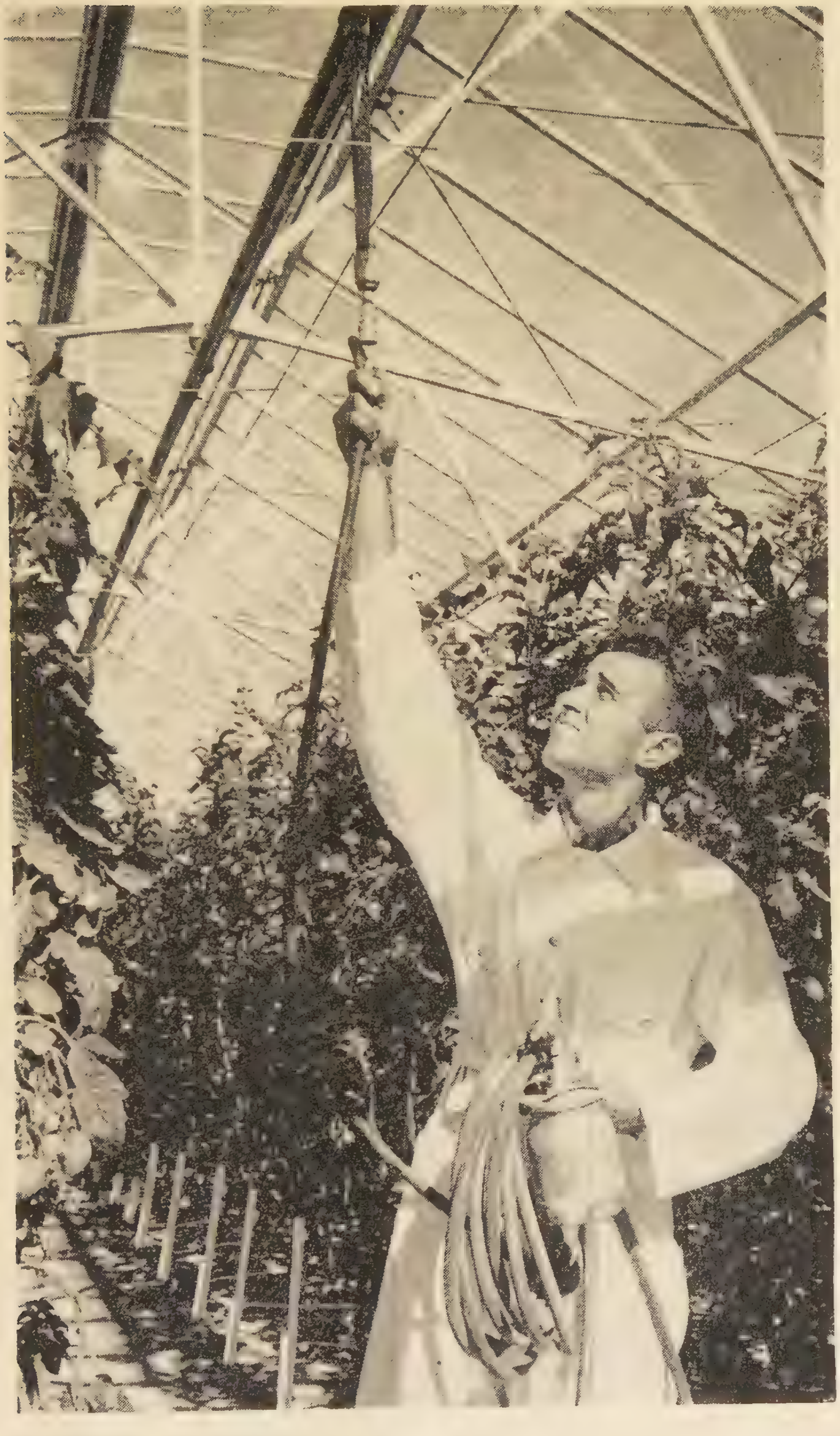


The air line in the glasshouse, showing the method of installing the air-hose couplings. The operator is about to plug the air hose into the coupling. He moves down the house, plugging the hose into couplings at 18 ft. intervals. From these couplings the 40 ft. hose reaches the sides of this 30 ft.-wide house down every row. Stakes at the ends of the rows prevent the hose damaging young plants.

Precautions in Spraying

Operators should take care not to inhale the concentrated spray mist of any therapeutant. Persons sensitive to materials such as thiram would be well advised to use a dust mask and wear protective clothing. Ventilators should be opened during spraying, but adjusted to prevent strong currents of air deflecting the stream of spray toward the operator.

Other Uses

Fruit-setting Sprays

Hormone fruit-setting sprays have been applied successfully through the spray gun at the Station. The only adjustment required is a reduction in pressure to 30 to 40 lb. per square inch to restrict the spread of hormone so that it does not go beyond the flowering trusses. Care must be taken in spraying the first truss not to permit excess spray to reach the growing point; otherwise distortion may occur. Very much faster operation and better coverage have been obtained by using a paint spray gun than with small hand-operated sprayers.

A fungicide (ferbam) is usually added to the fruit-setting spray, as recommended by Davison and Newhook (1956), for the control of incipient grey mould infection on treated trusses. The quantity of ferbam required is about 1 level teaspoon to 1 pint of fruit-setting spray.

Fruit-setting sprays are used at the concentration recommended by the manufacturers and should not be increased in strength for spray gun application.

Cost of Installation

The most expensive items of equipment are the air compressor and motor, either separate or as a combined unit. At the Station these were assembled from components already available. A method for converting a second-hand motor-cycle engine for use as a compressor has been described. No estimate of cost for these items is supplied.

For the remaining part of the equipment required for a 102 ft. x 30 ft. house, the following are estimates of quantities and prices.

	£	s.	d.
115 ft. of $\frac{3}{4}$ in. galvanised pipe at 1s. 3d. foot	7	3	9
6 $\frac{3}{4}$ in. galvanised pipe Ts ..		15	0
6 $\frac{3}{4}$ in. galvanised pipe sockets		6	0
1 $\frac{3}{4}$ in. galvanised nut union ..		7	0
6 $\frac{3}{4}$ in. galvanised plugs drilled, tapped to take $\frac{1}{4}$ in. gas thread		15	0
1 $\frac{3}{4}$ in. galvanised plug		1	0
6 $\frac{1}{4}$ in. barrel unions; gas thread		4	0
1 $\frac{3}{4}$ in. air cut-off valve		15	0
6 couplings	4	16	0
1 spray gun (new)	10	0	0
	25	2	9

References

R. M. Davison and F. J. Newhook, "Incorporation of Fungicides in Fruit-setting Sprays for the Control of *Botrytis* Fruit Rot in Glasshouse Tomatoes", "N.Z. Journal of Science and Technology", vol. 38A, No. 2, 1956.

All photographs by National Publicity.

Bail in closed position.

Cattle Bail of Simple Design

By P. C. MARSHALL,
Sheep and Wool Instructor, Department of Agriculture, Wanganui

THE cattle bail described is simple in construction and easy to use. The cost, always a major factor with this type of equipment, is reasonable. The materials, which must be of the highest quality to stand years of rugged use, can be purchased for about £6, which includes all bolts, metal work, and timber, but not bail posts. The bail has been found most effective for any average run beast.

TO counter the odd animal that attempts to lift the bail arm with the side of its neck, a rare but not impossible manoeuvre, a stop has been added to the bail in the form of an easily removable bolt let into the right-hand bail post immediately under and to the right of the lever arm.

Construction

When the site for the bail has been decided the posts (8 in. x 8 in. x 8 ft. 6 in.) should be set in position 30 in. apart **inside measurement.**

A hole (12 in. x 7 in. x 12 in.) must be dug in the position shown in the diagrams. For better finish and permanence it could be concreted at the dimensions given. The hole takes the bottom of the bail arm in the closed position and is an essential part of the

Materials

Metal Work (about 25s.)

2	23 in. of 2 in. x $\frac{3}{8}$ in. flat iron
1	12 in. of 2 in. x $\frac{3}{8}$ in. flat iron
1	3 ft. 4 in. of 2 in. x $\frac{3}{8}$ in. flat iron
1	length of 2 in. x $\frac{1}{4}$ in. flat iron for bearing

Timber

4	5 ft. of 3 in. x 2 in.
6	2 ft. 6 in. of 6 in. x 2 in.
2	3 ft. 10 in. of 6 in. x 2 in.
1	5 ft. 6 in. of 6 in. x 2 in.
1	6 ft. 4 in. of 6 in. x 2 in.

(Dressed tallow wood or karri)

Coach Bolts

16	12 in. x $\frac{3}{8}$ in.	2	3 in. x $\frac{1}{2}$ in.
6	9 in. x $\frac{3}{8}$ in.	1	9 in. x $\frac{1}{2}$ in.
2	12 in. x $\frac{1}{2}$ in.	3	13 in. x $\frac{1}{2}$ in.

Washers for all bolts
1 stop bolt and chain

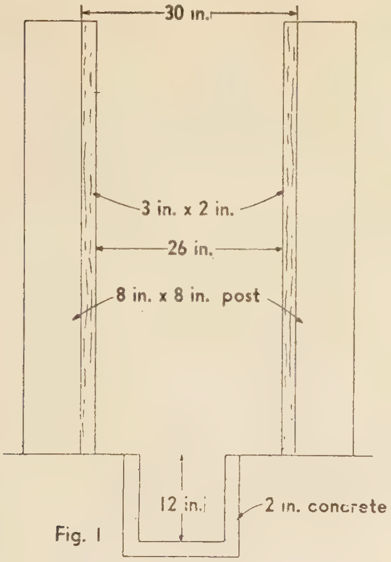

30 in.
3 in. x 2 in.
26 in.
8 in. x 8 in. post
12 in.
2 in. concrete

Fig. 1

Fig. 1—The 8 in. x 8 in. x 8 ft. 6 in. bail posts set in position 30 in. apart (inside measurement) with four 5 ft.-long pieces of 3 in. x 2 in. bolted to them to form 2 in. slots.

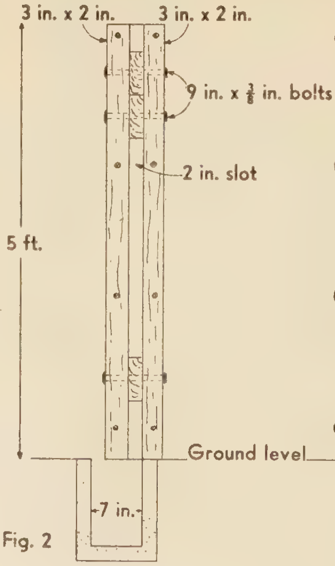

3 in. x 2 in.
3 in. x 2 in.
9 in. x $\frac{3}{8}$ in. bolts
2 in. slot
5 ft.
Ground level
7 in.

Fig. 2

Fig. 2—Inside view of the 3 in. x 2 in. pieces bolted to one post, showing length of timber and bolt placings for both 3 in. x 2 in. and fixed 6 in. x 2 in. timber.

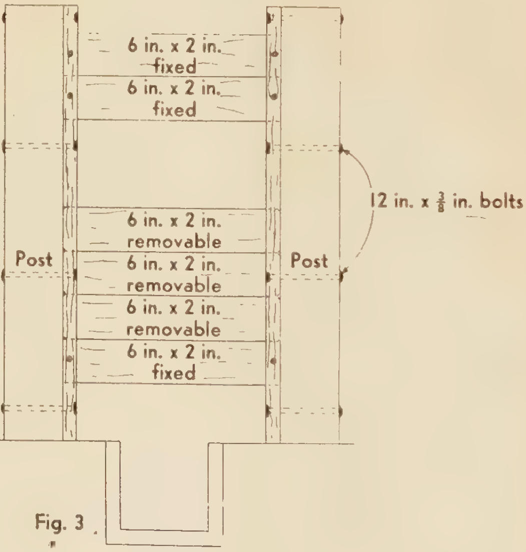

6 in. x 2 in. fixed
6 in. x 2 in. fixed
12 in. x $\frac{3}{8}$ in. bolts
6 in. x 2 in. removable
Post
6 in. x 2 in. removable
Post
6 in. x 2 in. removable
6 in. x 2 in. fixed

Fig. 3

Fig. 3—Front view of the bail with fixed 6 in. x 2 in. and removable 6 in. x 2 in. timber in correct position for use. To remove 6 in. x 2 in. boards simply lift one end until clear of slots, push back slightly, and lift out. Three 6 in. x 2 in. may be taken out to accommodate differing heights of beasts.

bail, for if it was not there and the bail arm was cut short at ground level, the bottom of the bail arm in the open position would be 12 in. higher than shown in the plan and would strike each beast on the head or neck as it was lowered.

The 5 ft. lengths of 3 in. x 2 in. timber are bolted to the inside of each post to form a 2 in. slot down the centre of each post (Fig. 2). The three fixed pieces of 6 in. x 2 in. timber are then bolted in position (Fig. 2) and the three removable 6 in. x 2 in. pieces fitted (Fig. 3). The two 3 ft. 10 in. lengths of 6 in. x 2 in. are then bolted to the bail posts, one level with the tops of the posts and the other 8 in. from ground level. A third 6 in. x 2 in., 5 ft. 6 in. long, is placed on these two cross members and in line with the inside edge of the right-hand bail post. Two 13 in. x ½ in. bolts, top and bottom, secure this and the two cross members to the right-hand bail post (Fig. 6).

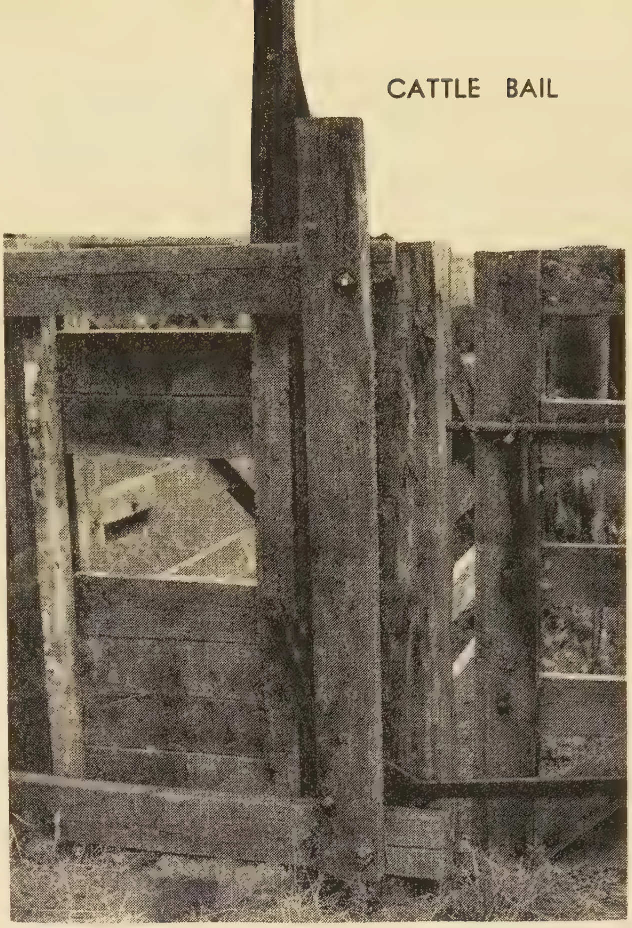
Metal Work

The top metal strap 1 ft. 11 in. long is fixed in position on the bail arm, which is 6 ft. 4 in. long, so that it will allow easy vertical movements; this could be done with a flanged bolt and a lynch pin or locking bolts. On the top of the right-hand bail post a length of 2 in. x ¼ in. flat iron is rolled to form a bolt guide or bearing for the top strap; this may be secured to the bail post with heavy galvanised screws.

The lever arm requires three pieces of welding and careful measurement to obtain the correct angle on the handle. Cut three pieces of 2 in. x ⅜ in. flat iron to the following lengths: 23 in., 12 in., and 3 ft. 4 in.

Lay the 23 in. length of iron flat on a straight edge and set the 3 ft. 4 in. length on its flat at 96 degrees from one end and mark the angle; cut and weld. At any suitable point the 12 in. strip may be welded across the corner to form a brace (see diagram 6).

Setting the bail arm lever is simple. Bolt the left-hand end of the 23 in. metal strap (now part of the lever) to the bail arm 1 in. up from the bottom 3 ft. 10 in. 6 in. x 2 in. brace and in the centre of the bail arm. Now lift the bail arm into the open position (Fig. 6), making sure the arm is hard against the right-hand post. The right-hand end of the lever will now be in the correct position to mark, drill, and bolt. Form a handle and bend the top of the lever arm as shown in Fig. 6 to give easy action and use. All metal ends should be rounded.



Bail in open position.

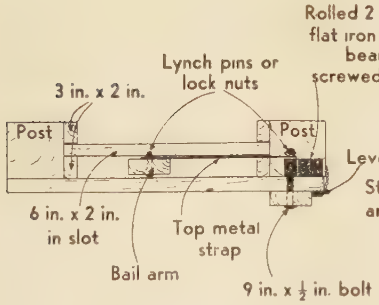

Rolled 2 in. x ¼ in. flat iron to form bearing screwed to post
Lynch pins or lock nuts
3 in. x 2 in.
Post
Post
6 in. x 2 in. in slot
Top metal strap
Bail arm
9 in. x ½ in. bolt

Fig. 4

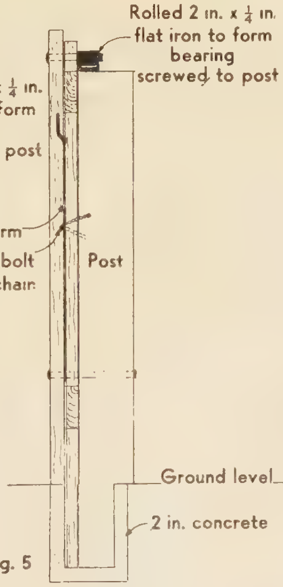

Rolled 2 in. x ¼ in. flat iron to form bearing screwed to post
Lever arm
Stop bolt and chain
Post
Ground level
2 in. concrete

Fig. 5

Figs. 4 and 5—A plan and side view of the bail to illustrate relative positions of braces and 2 in. x ¼ in. rolled metal bearing on right-hand post. In Fig. 5 the bolt the lever moves on is shown dotted.

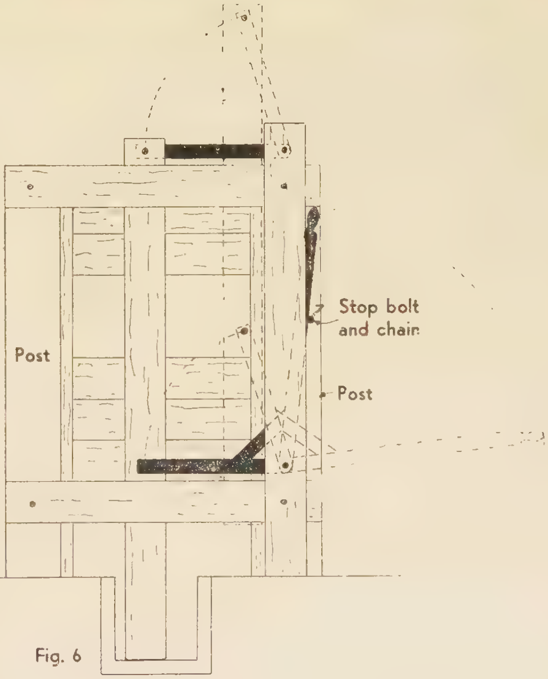

Post
Stop bolt and chain
Post

Fig. 6

Fig. 6—The bail in both open and closed positions. Headroom with bail closed is 7 in. The action of the bail arm and lever is shown. The 6 in. x 2 in. cross members and upright are shown bolted in position on the front of the bail.

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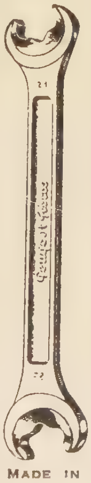

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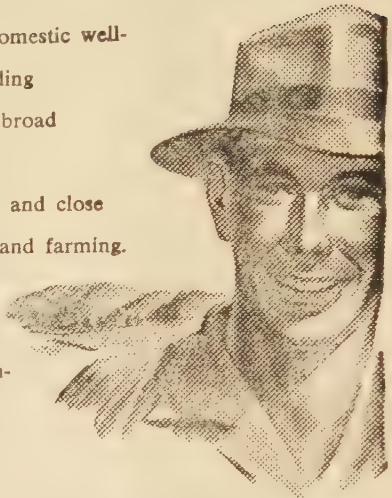

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Overwintering a Domestic Apiary

Seasonal Notes for the Domestic Beekeeper

By D. A. BRISCOE,
Apiary Instructor, Department of Agriculture, Tauranga

IN most parts of New Zealand a considerable number of colonies die out in winter or emerge very weakened the following spring. Correct autumn management is very important for the successful wintering of bee colonies and this work should not be neglected. There is little or no pollen or nectar available in winter for bees to supplement their stores, and temperatures are usually too low to allow foraging by the field bees.

Hives placed close to a hedge or under a belt of trees are likely to be damp and draughty and provide poor shelter for wintering bees.

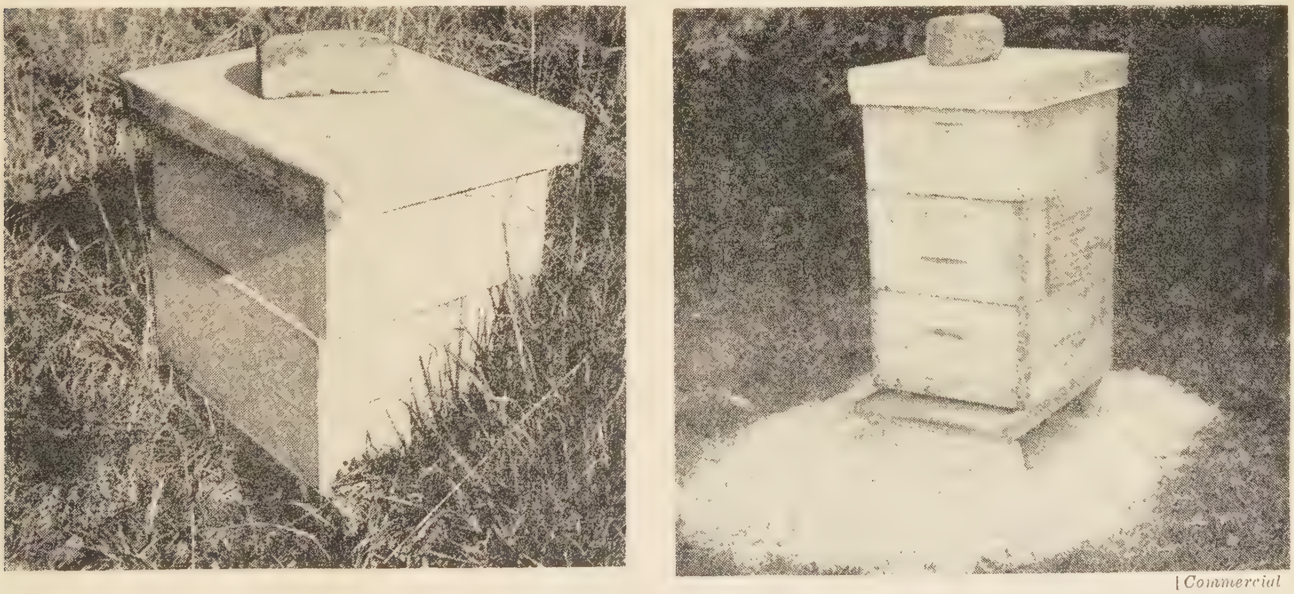
STARVATION is the main cause of winter losses or hives dying out, but failing queens and bee diseases are other causes of losses.

Before closing a hive down for the winter it should be examined to ascertain whether it has an adequate supply of honey and pollen, plenty of young bees, and is headed by a good and preferably young queen. A close watch should be kept for any signs of American foul brood (*Bacillus larvae*). The symptoms of this disease were described in the domestic beekeeping notes in the September issue of the "Journal".

The hive should be protected from the cold prevailing wind and the colony established in material that is close fitting and rain proof.

In New Zealand, colonies appear to winter best in two full depth boxes, and it is therefore necessary to remove all surplus supers above the second box. Sufficient comb room should be left in the brood nest to allow space for the queen to continue brood rearing and for the bees to cluster comfortably. It is important to check the age and condition of the queen, as her vitality must be unimpaired if she is to carry the hive through the winter or spring in a prosperous condition. A young queen should breed well into the winter so that the colony can emerge in spring with plenty of young, vigorous workers.

In the colder parts of the country hive entrances should be contracted to about 3 in. by ¼ in. with a wooden entrance block. In warmer districts, however, it may be desirable to increase the width of the entrance, but it would be inadvisable to alter the depth of the opening. Where flat lids are used hive mats should be taken off the hives during winter, particularly in the north, to allow the colony



[Commercial

Left—A hive entrance overgrown with grass, causing obstruction to the flight of bees and bad ventilation. Right—A layer of sawdust or coal ashes around beehives suppresses grass growth.

[Elmwood

Hive entrances should be contracted in winter to about 3 in. by ¼ in. A strip of wood as shown is suitable for this purpose.

to keep dry. Hive mats often become waterlogged during winter and make the inside of the hive damp and musty.

Weak Colonies

Weak colonies usually result from poor queens or from restricted brood rearing space in the hive during summer. It is very unwise to winter such colonies, as they seldom build up sufficient strength during spring to take full advantage of the following season's honey flow.

It is sound beekeeping to unite weak colonies to other hives. This is a simple matter and is carried out by killing the older queen and then placing the complete brood nest and all the bees wholly on top of a queen-right hive with two sheets of newspaper spread between the colonies. The bees will chew through the paper and the bees in each hive will be accepted amicably by the other.

Winter Stores

The amount of honey stores required to carry colonies through winter and early spring varies in different districts. In some areas there are early spring sources of nectar such as willow, five finger, and barberry; in others there is a dearth of nectar. However, in all districts at least 50 lb. of well ripened honey should be provided. This amount is equivalent to a completely filled full depth super. If this quantity cannot be provided, the shortage may be supplemented by feeding a heavy solution of sugar syrup made from 2 parts of sugar to 1 part of water. This should be fed inside the hive and only as much of the syrup as the bees can take up in the one night given at a feeding.

There is a tendency with many beekeepers to skimp on the honey stores left on the hives for winter feeding. Failure to provide a margin of safety by leaving the colony a few pounds too short of stores at this period can result in a loss with next year's crop of honey.

Shelter

Colonies should be located where they can receive the maximum amount of sunshine and protection from prevailing winds. It is best to place hives with their entrances facing north so that all sunshine falls on the fronts of the hives. A site in front of a 6 ft. or 8 ft. hedge will be well sheltered. A timber or iron fence will also provide a satisfactory wind-break.

Many beekeepers make the mistake of placing the hives right up against a hedge or under a belt of trees. The hives should not be placed closer than 4 or 5 ft. from a hedge and because of the cold, draughty conditions which can be expected at the base of a belt of trees the placing of hives in such a position should be avoided.

It is very important to keep all vegetation around the hives in check during winter. On any warm day in winter the bees require cleansing flights and if grass and second growth obstruct the entrances, a large percentage of the flying bees may become chilled or lost in the grass before being able to return to their hives.

Long grass round a hive also promotes dampness within the hive.

Autumn-sown Cereals

AUTUMN-SOWN cereals provide for one of three requirements—a grain crop, a green feed crop, or a green feed and ultimate grain harvest.

WHEAT is mainly autumn sown in Canterbury and North Otago, principally for a grain crop, but if necessary it can be used as valuable green feed, and the feeding off of strongly growing crops from late winter to early spring is not uncommon.

Arawa and Aotea are now the recommended varieties—Arawa for growing on the heavy, fertile country which formerly grew Dreadnought, and Aotea on Cross 7 country. Sowing rates are from 1½ to 2 bushels per acre, drilled with 1 cwt. of superphosphate per acre. May and June are the main sowing months.

April and May are the main months for the autumn sowing of oats. More use is made of oats for green feed than is made of wheat. Strongly tillering varieties such as Algerian and Dun are usually sown at 1½ to 2 bushels per acre, and the more upright Abundance and Onward are sown at 2 to 2½ bushels per acre. The recommended fertiliser is superphosphate at 1 cwt. per acre.

Barley when autumn sown almost invariably provides green feed only and the chief varieties used are Cape barley and Black Skinless, the former being more suited to cooler climatic conditions. Rapid early growth makes barley an excellent green feed when urgent feed is needed.

Wong is a variety which, while slower to establish than the other varieties mentioned, recovers better after grazing and yields more heavily. Sowing rates recommended for barley for green feed are from 2½ to 3 bushels drilled with 1 cwt. of superphosphate per acre.

—J. G. RICHARDS,
Instructor in Agriculture,
Department of Agriculture,
Oamaru

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Strawberries Grown without Soil Cultivation

By L. A. PORTER,
Research Officer, Levin Horticultural Research Station

THE use of weedkillers in place of soil cultivation for the establishment of pastures and some field crops has been described in recent articles in the "Journal". Results obtained indicated the possibilities of applications in preparation of areas for horticultural crops. In a pilot trial carried out at the Department of Agriculture's Levin Horticultural Research Station this season weedkillers were used to eliminate vegetation from an area which had been in lawn. Strawberries were planted without any further soil preparation. Subsequent weed growth has been controlled by the use of either black polythene sheeting or sawdust as a mulch. This preliminary report covers the first 7 months after the start of the work.

PLANTS have established well and made good growth. Where the black polythene was used as a mulching material the plants are slightly, though definitely, more vigorous. The use of this material in strawberry growing is in itself a recent development of considerable promise.

Preparation and Planting

A patch of ground was selected in an area which had been sown down with perennial ryegrass (*Lolium perenne*) in November 1955 and maintained as a closely mown sward with clippings returned. The most abundant species were *Poa annua*, *Poa trivialis*, and white clover (*Trifolium repens*). Other species present were browntop (*Agrostis tenuis*), perennial ryegrass, Yorkshire fog (*Holcus lanatus*), daisy (*Bellis perennis*), dandelion (*Taraxacum officinale*), *Veronica agrestis*, and creeping buttercup (*Ranunculus repens*).

The patch was mown for the last time on 9 May 1958. The weedkillers were applied as follows:

Amitrol (50 per cent), 5 lb. per acre.

Dalapon (85 per cent), 5 lb. per acre.

These were applied together, mixed with water, at 32 gallons per acre. The first application was made on 19 May. By 1 June the grasses were brown, but clover and other plants appeared almost unaffected. The second application of weedkillers was made on 4 June. By 27 June most of the vegetation was dead, though a few patches of *Veronica agrestis* and *Ranunculus repens* persisted in spite of typical amitrol damage.

Strawberries were planted on 25 July into T slits made with a spade. The plants were inserted at the intersection of the slits and the soil was firmed about the roots.

The four varieties used were Talisman, Auchincruive Climax, Lassen, and Merton Princess. The plants were set out in rows 3 ft. apart with plants 15 in. apart.

A balanced fertiliser containing nitrogen, phosphorus, and potash was applied as a side dressing at 40 cwt. per acre to all but one row. It was applied just before the plastic mulch was put in position.

Black polythene sheet 0.002 in. thick and 6 ft. wide was applied to part of two adjoining rows of Talisman on 11 September. Slits were made in the plastic midway between the rows and at 45 in. intervals to allow water to enter.

The remainder of the area was mulched with sawdust to a depth of 1½ in. on 23 September.

Results

Strawberry plants established well. Growth of all varieties up to mid December was at least equal to that of plants set out in conventionally prepared soil elsewhere on the Station.

Within the trial Talisman plants under polythene were a slightly darker green and more vigorous than those under the sawdust mulch.

In mid winter, at the time of planting, the soil was not difficult to handle. Water percolated quickly into the soil after rain and this soil carried traffic almost as well as the adjacent mown area. The top few inches of soil had a large earthworm population and were permeated with roots of the previous plant cover. It was obvious that the original good structure and physical condition of the soil had been maintained.

After a dry period and before application of sawdust there was some shrinkage of soil and exposure of roots due to opening of planting slits; mulches counteracted this trouble.

Fruits resting in small pools of water occurring on the plastic after rain may

Talisman strawberry plants growing on black polythene sheeting. The slits between the rows allow water to enter the ground.

be adversely affected. Because of this, small slits were made beside some plants to allow this water to drain away.

Weed growth was completely suppressed under the plastic cover. There was some growth through the sawdust mulch, though generally this was less common than on cultivated areas mulched with sawdust.

Yields of fruit were not recorded in this preliminary trial. Observations indicate that in time of ripening, quantity and quality of fruit produced so far plants are comparable with those of the same varieties elsewhere on the Station.

Advantages of the method of soil preparation for strawberries used in this trial lie in the elimination of soil cultivation at times when seasonal conditions are unfavourable, the preservation of a stable soil structure, and the elimination of recurrent weed infestation accompanying cultivation. It has particular merit when used to precede polythene sheet mulching.

It is emphasised that this is a preliminary investigation and the methods described have not been fully evaluated. For instance, costs involved in the use of weedkillers, as in this trial, would exceed the cost of soil preparation by conventional means. Several other aspects require more detailed investigation. At present the method of strawberry culture described appears sufficiently promising to warrant further work.

A full report will be published at the conclusion of the trial.

Show Dates

THE following are dates and venues of A. and P. shows up to the end of April:

NORTH ISLAND

March

20 and 21 March—Wellsford A. and P. at Wellsford.
21 March—Poverty Bay Autumn Carnival at Gisborne.

SOUTH ISLAND

March

21 March—Methven A. and P. at Methven.
*21 March—Hawarden A. and P. at Hawarden.
30 March—Strath Taieri A. and P. at Middlemarch.
30 March—Mackenzie County Highland Show at Fairlie.

April

4 April—Oxford A. and P. at Oxford.
11 April—Malvern A. and P. at Sheffield.

* The Department of Agriculture exhibit will be staged at this show.

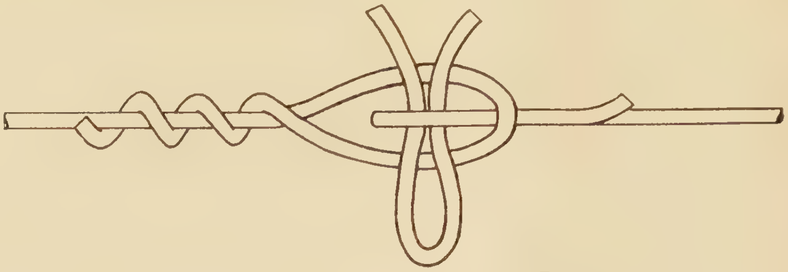
Wool Sales

The dates and venues of wool sales until the end of May are:

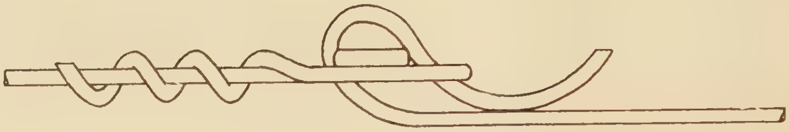
16 and 18 March: Auckland.
23 and 25 March: Napier.
6 April: Wellington.
18 April: Christchurch.
23 April: Dunedin.
27 and 29 April: Invercargill.
11 and 13 May: Auckland.
18 May: Napier.
21 May: Wanganui.
25 May: Wellington.

Knot for Fence Wires

A SIMPLE and effective knot for standard fencing wire that is commonly used at Chatham Islands is illustrated. It is easily made and simplifies the tying of wires after re-straining.



Top view.



Side view.

A loop or eye is made on the end of one wire in the usual way. The other wire is bent to form a U at the correct place and this is then inserted into the loop on the first wire. Then a pin somewhat like a large staple made from doubled No. 8 wire is put through the bent wire. The joining should be done while the wires are under tension. When the wires are released from the strainer the knot pulls tight and both wires bind against the pin. The use of this knot is not restricted to No. 8 wire.

—*E. A. MADDEN, Agrostologist,*
Department of Agriculture, Palmerston North

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during November 1958 and for the 4 months ended 30 November 1958 with comparative figures for the same month and the 4 months of 1957 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
November 1958	24,602	357	24,959	—
November 1957	25,157	405	25,562	—
Decrease	—555	—48	—603	—2.359
4 months ended 30/11/58	81,801	1,108	82,909	—
4 months ended 30/11/57	79,906	1,188	81,094	—
Increase	+1,895	—80	+1,815	+2.238

Butter in store at 30 November 1958 was 21,153 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
November 1958	8,698	2,166	10,864	—
November 1957	11,504	1,953	13,457	—
Decrease	—2,806	+213	—2,593	—19.269
4 months ended 30/11/58	24,184	5,649	29,833	—
4 months ended 30/11/57	29,727	4,992	34,719	—
Decrease	—5,543	+657	—4,886	—14.073

Cheese in store at 30 November 1958 was 10,749 tons

If these figures are converted into butterfat equivalent, there is a decrease of 0.399 per cent in butterfat graded for the 4 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Peak Performance and Long Life from Rubber Tyres on Tractors and Implements

By J. L. DOUTRE,
Machinery Instructor, Department of Agriculture, Auckland

RUBBER-TYRED machines, particularly tractors, have been adapted to so many purposes in New Zealand farming that today's high output per unit of labour is very dependent on them. Such machinery can be operated efficiently and economically only when tyres are correctly fitted and maintained and abuses are avoided. Many tyres find their way prematurely to the scrap heap because of rough treatment or neglect and this article suggests how such tyres could have been saved for years of further wear.

IT is 25 years since rubber tyres were first sold on agricultural tractors. During that time their use has steadily increased, so that now they are standard fittings on almost all wheel tractors. Their reduced rolling resistance compared with that of steel wheels has led to a general speeding up of tractor work and an increase in power at higher speeds. Rubber tyres have increased fuel economy and performance much more than enough to pay for their extra cost. Certain work now done by modern tractors would be impossible on steel wheels.

Advantages of Rubber Tyres over Steel Wheels

Rolling resistance consumes much of the traction of the tractor on steel wheels, especially at higher speeds. Tractors that operate well on rubber will scarcely pull themselves in top gear on lugged steel wheels because of the effort consumed in raising the tractor up on to lugs, pushing them into the soil, and pulling them out again. Ground impact is transmitted from the wheel through the tractor and leads to higher maintenance costs and wear. The discomfort of vibration is felt by the operator and leads to fatigue and reduced human efficiency. For these reasons a tractor with steel wheels must be driven more slowly than one on rubber tyres, especially over hard or rough surfaces.

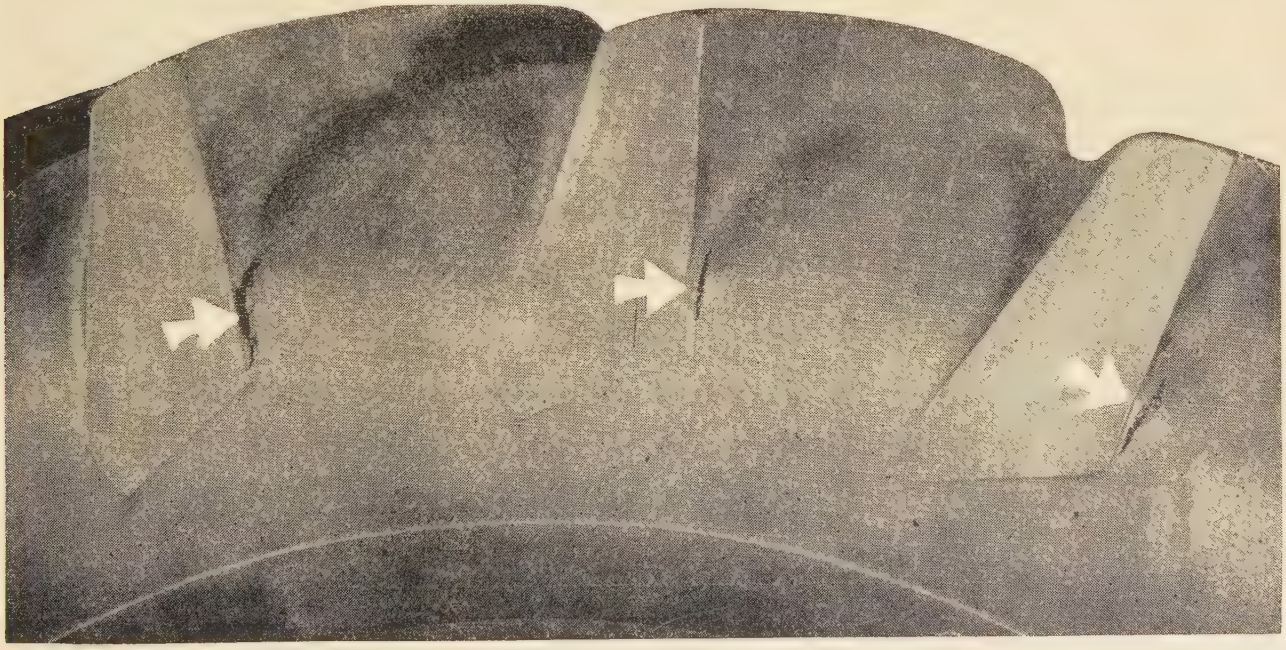
Greater speed is a definite advantage given by rubber tyres, and any machine used for carrying goods on the farm should have rubber tyres, as they save time and operating costs. The tractor with rubber tyres is not restricted to the farm, but can cover long distances on roads within a reasonable time; it does not cut up paddocks or damage smooth surfaces.

Another advantage leading to the almost complete swing to pneumatic tyres has been the need for higher efficiency over a wider range of gears. This greater efficiency has been accompanied by almost parallel fuel economy. Under ideal conditions rubber-tyred tractors use 20 per cent less fuel than steel-wheel tractors on similar work. More gears lead to a better matching of the tractor to its implements and therefore greater mobility.

Under some conditions rubber can give more traction than steel wheels with lugs; for example, in sand or on very hard surfaces where steel cannot grip.

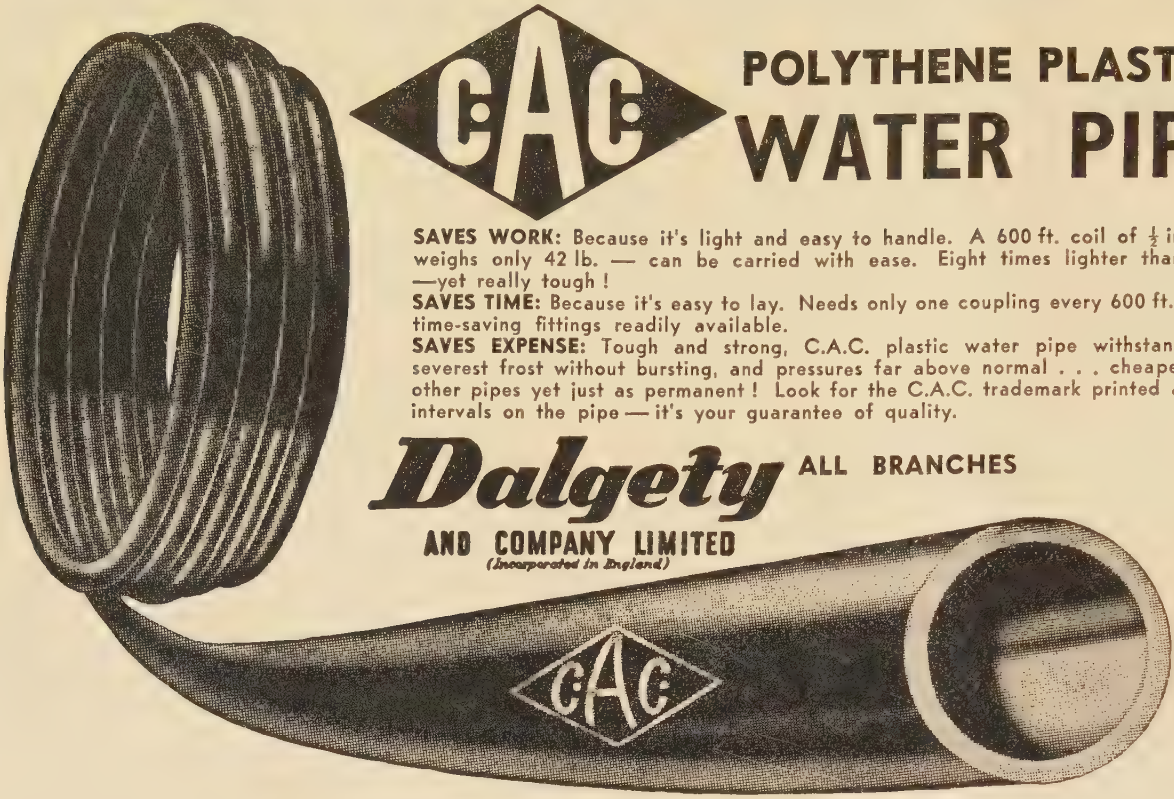
Where Rubber Tyres are Inferior

Rubber tyres can be inferior to steel wheels with a heavy load on wet turf or on grass and clover swards, when rubber tyres must be heavily weighted to get full use of their power without



Under-inflation has destroyed this nearly new tyre. Characteristic breaks (arrows) have been caused by too-low pressure on hard roads. The tread bars could not penetrate the ground so they penetrated the casing wall. Use 18 to 20 lb. air pressure on hard roads or on highways with heavy loads.

Brings ***more*** *than WATER — brings SAVINGS too!—*



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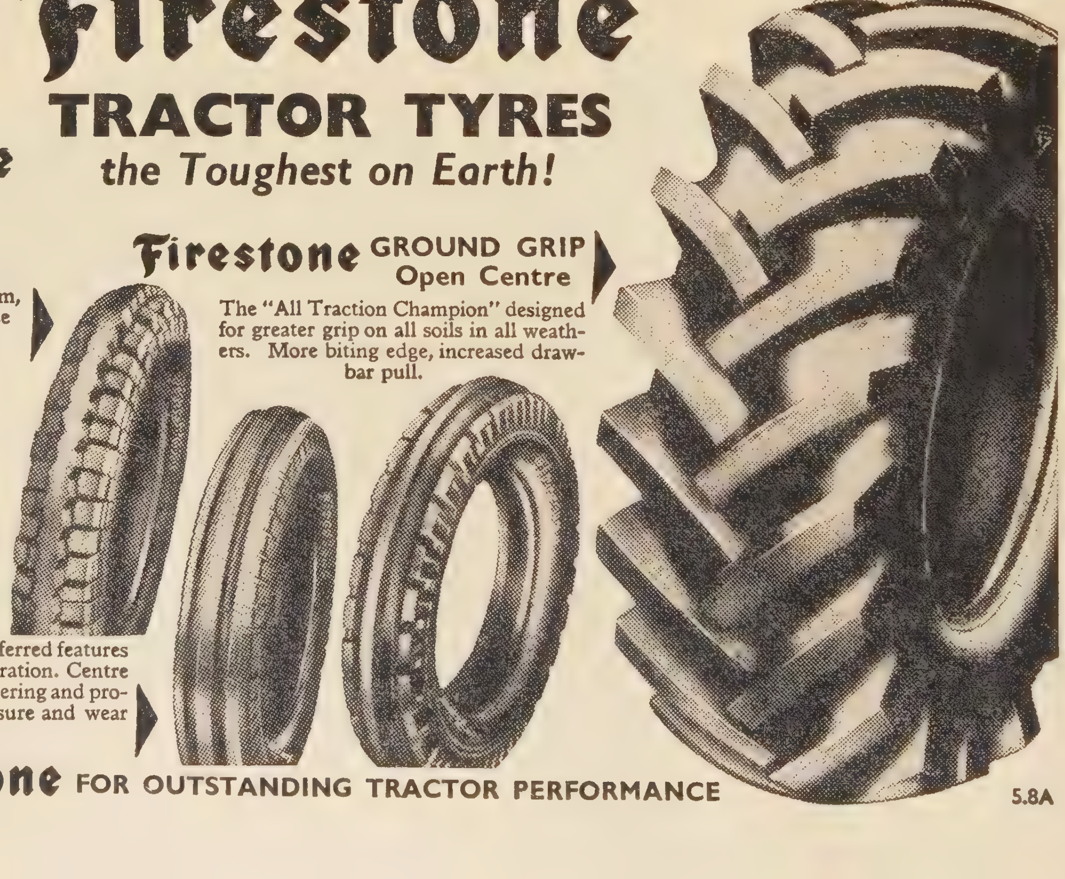

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Tractor Tyres

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5.8A

slipping. Wheel slip wastes power, fuel, and rubber and can be dangerous on slopes or wet areas.

Rubber tyres are much less satisfactory than steel wheels on greasy surfaces where the ground beneath is firm and the tyre treads cannot grip. These are also unsuitable for cut-over land, on which sharp stumps are a constant danger to tyres. With rubber tyres there is also the risk of spinning or skidding tyres being cut or split by sharp objects in the soil or grass.

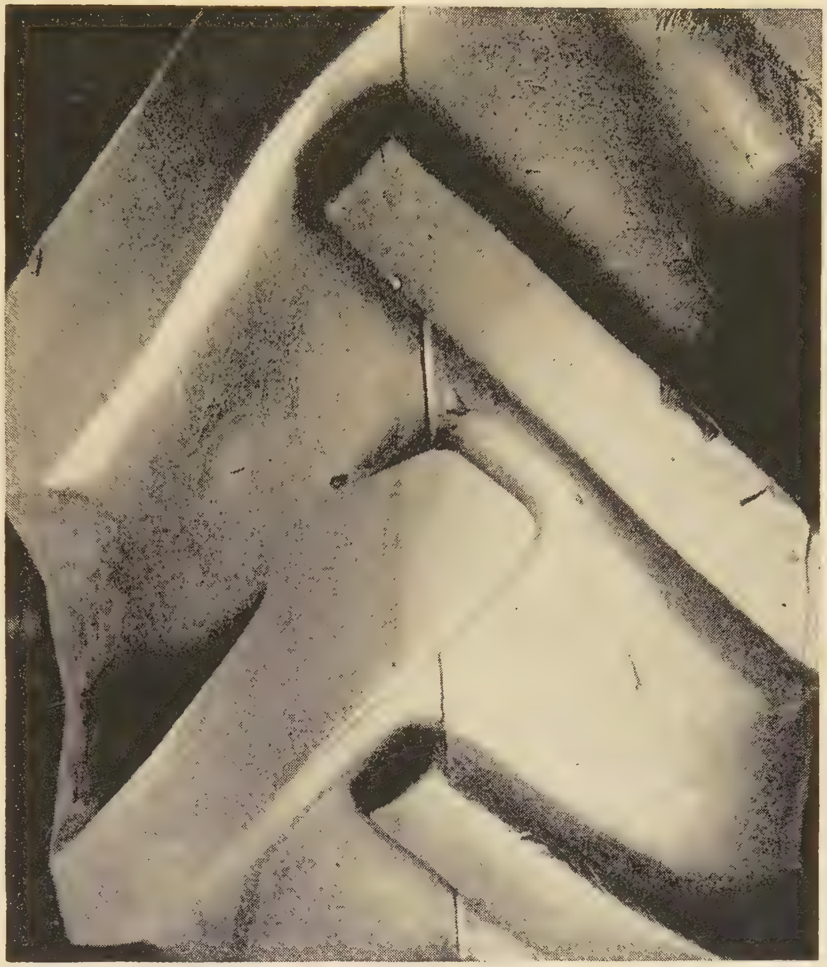
Compromise

Rubber tyres or steel wheels each have advantages under certain conditions. It is wise to weigh their relative merits, taking into account efficiency, safety, and speed of working.

With heavy loads and on slow work, such as ploughing, wheel slip constitutes a serious loss of power. Because of the relatively slow speed of operation, steel wheels are generally superior for ploughing. Speeding up the work causes an increase in ground friction between plough and soil, only causing further waste of power. Wheel girdles or chains can be adapted to rubber tyres, but many of the tyres' original advantages are lost.

If much slow, heavy work is to be done, it is worth while having both steel wheels and rubber tyres. The steel wheels should be stored in the implement shed until required for special jobs.

If little ploughing is done, but there is need for extra traction, it is wise to use extendable steel strakes, which can be easily engaged when needed and act as wheel weights when not in use. With them, operating on steep country or on wet grass becomes much safer, as they prevent slipping back or sideways. However, the added traction can cause a backward somersault if care is not taken when going up steep hills or through ditches or when pulling heavy loads.



High speed and hard roads have caused this characteristic wiping of the tread bars on this tyre inflated to normal pressure. The wear is especially noticeable on the inside of the tread pattern. Low pressure causes a wiping of the trailing edge; here high speeds at normal pressure have caused a grinding off of the leading edge. Changing the tyre over to the opposite side would have given more even wear.

This small cross fabric break can easily be repaired and the tyre will give full service, but if the tyre is not repaired promptly, moisture will work into the fabric and lead to further damage. Further use would also enlarge the damaged area, entailing more extensive repairs.

Tyre Design

Almost all the load on a pneumatic tyre is carried by the compressed air within the casing, so it can be said that the weight that a tyre can carry depends mainly on the amount of air in the tyre and the strength of the casing wall to resist the internal air pressure. A small tyre with a strong casing wall can be inflated sufficiently to support a load similar to that which can be placed on a much larger tyre having a thin casing and inflated to a lower pressure. Each type of tyre has its particular advantages and both are used on a tractor.

The smaller, higher-pressure tyres fitted in front are designed to reduce rolling friction yet be large enough to carry the load without sinking too deep. In this way they get sufficient penetration to give good steering. In

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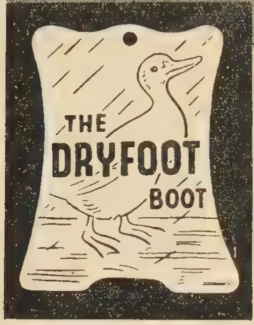

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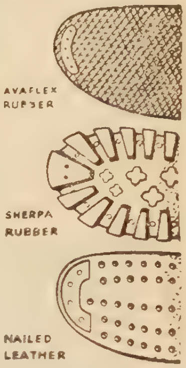

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rough going with heavy pulls some of the weight is transferred to the rear wheels.

The rear wheels work on the other principle of using large-section, large-diameter, lower-pressure tyres. The casing walls are comparatively thin in relation to tyre size, and support for the load depends on the greater volume of air. This system has four advantages:

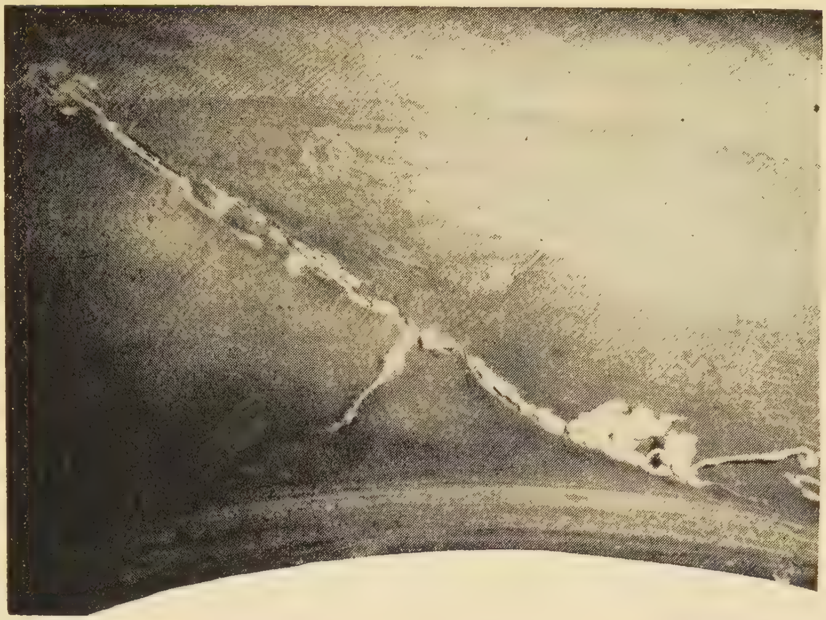
1. A heavy load can be carried on a tyre inflated to a relatively low pressure. The larger, softer tyre deflects to spread the tread wider, giving greater ground contact.
2. The large-diameter tyre has a long area of ground contact.
3. A large tyre makes fewer turns and is therefore subject to less wear.
4. When it is climbing over an obstruction a large tyre has a lower angle of rise and the tyre being softer also absorbs part of the obstruction, so that vertical lift and consequently rolling resistance are reduced.

Effect of Tread Design

The open, angled tread bars on modern tyres give maximum traction combined with good cleaning for field work. The tyres should be fitted so that the apex of the tread design faces forward. Soil then moves outward from the centre, giving wider ground contact as the tyre digs in and assists the cleaning action.

Tyres used on hard roads should have a continuous central rib.

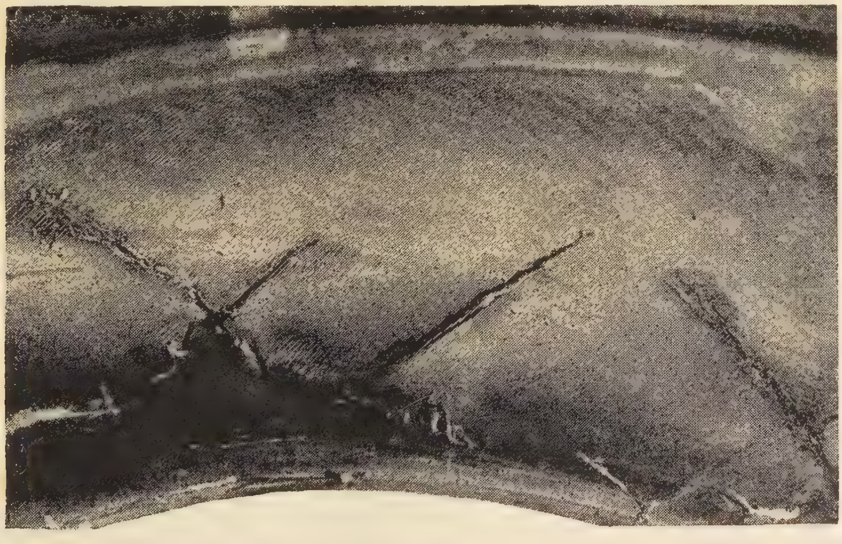
Trailed equipment such as drills and topdressers which use ground drive to operate the machines should have the tyres fitted with tread reversed so that the apex faces backward.



This fabric break has been allowed to spread across the tyre, making repairs almost impossible. Early repairs would have saved the tyre for long service.

Tractors working regularly in sand, where cleaning is not a problem and the tyres tend to dig in, often have the rear tyres reversed so that the tread actually gathers the sand beneath the wheel. Tyres should be changed back when the tractor is not working on sand. Special button tread designs have been developed for tractors working extensively on sand.

Front tractor tyres or equipment not dependent on ground drive for operation do not need traction tread. A straight rib design prevents side slip and assists steering. Tyres with block treads on the side walls have been designed for improving ability to climb out of furrows. High central skid ring tyres are available for use in soft fields. They act as a rudder to make sharp turns or maintain a straight course under loads.



Severe under-inflation of this tyre on the land side of the furrow has caused a series of breaks right round the tyre. The tilt of the tractor and the extra weight combined with heavy pull have changed normal inflation to severe under-inflation and caused rapid destruction of a good tyre. Four pounds added air pressure could have saved this tyre for four more years of work.

Weighting Tractor Tyres

Wheel slip is one of the main causes of waste of power with farm tractors. Improper weighting of the tractor, poor matching of machinery to the tractor to use the power efficiently, and over-inflation of tyres on soft going lead to considerable loss of power, fuel, and rubber. A tyre should not slip for more than 5 per cent of its circumference on the road or more than 15 per cent in the paddock. Excess tyre wear will occur if this is exceeded.

To use the full power available from the motor and get traction a modern rubber-tyred tractor must be heavily weighted. For every 2 lb. added, about 1 lb. more drawbar pull can be obtained, up to the capacity of the engine.

For each 100 lb. added to the tractor, the drawbar pull is increased in accordance with ground surface conditions as follows:

	lb.
Green, clovery sward	36
Sand	36
Sandy loam	50
Dry clay	55
Concrete or bitumen roadways	66

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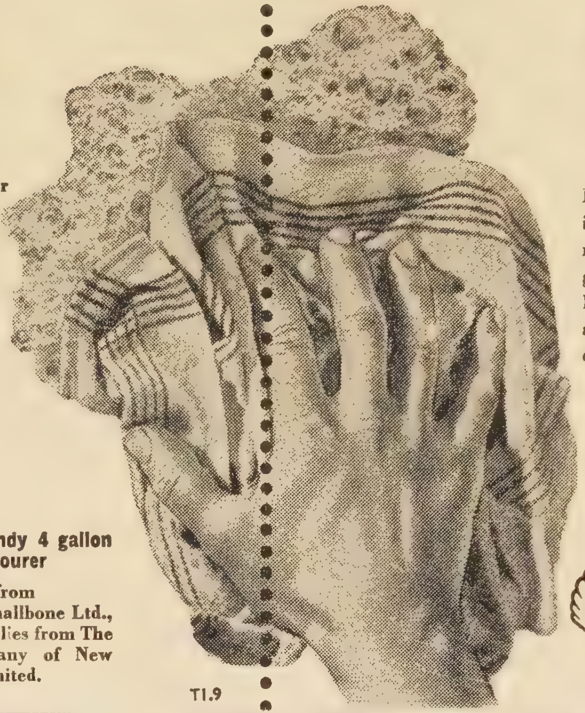

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Three ways of loading the tractor are:

1. Transferring the weight of the implement and its load to the tractor by design and hitch arrangement.

2. Adding cast iron or concrete weights to the tractor wheels or framework.

3. Adding weight to the wheels by filling the tyres partly or completely with water.

The type of surface used by the tyres determines the drawbar efficiency of the tractor.

Correct Inflation Pressures

It is disturbing that probably more tyres are thrown on the scrap heap because of misuse than ever actually wear out. Correct inflation pressure is the most important factor in the satisfactory performance of tractor or implement tyres.

The volume of air in the tyre carries the load and at the recommended pressure the tyre is able to flex normally without injury. Air is free; tyres are dear. A little time spent in servicing tyres can save costly replacement.

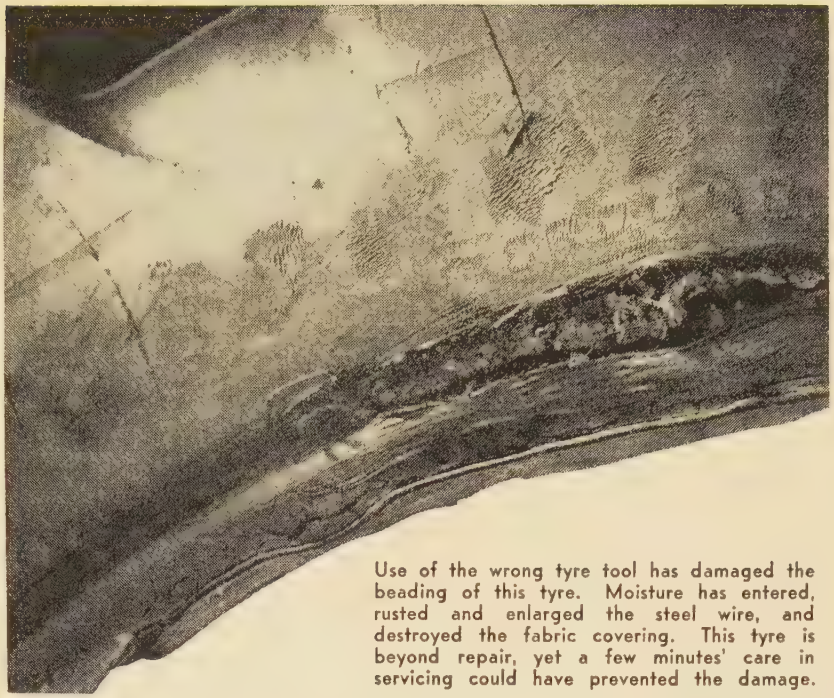
Under-inflation causes damage to the tyre by repeated folding and buckling of the side walls; the result is a series of breaks and cord separations. Local heating and bending cause cracks to form at the base of each lug.

Misuse can consume years of tyre life in a few hours: Grit, stones, and vegetation working in between the tyre and rim, causing damage to the tyre beading; rims bruising the side walls of tyres when they go over a bump or obstacle; and tyres "creeping" on the rims or wheels actually spinning in the tyres, ripping the valve stems off the tubes.

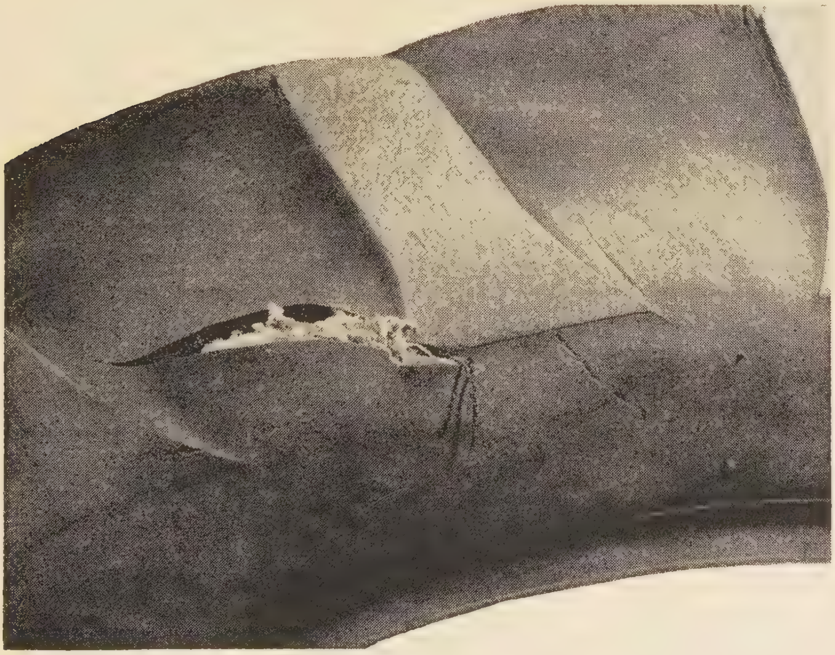
When an under-inflated tyre is used on hard roads the tread bars wipe across the road as the tyre squirms under load and again as it resumes its natural shape. This scraping action causes the trailing edge of the tread bars to wear quickly. The centre of the tyre casing buckles upward, causing rapid wear of the shoulders of the tyre. Pressures of 10 to 12 lb. can be used safely in soft ground where the tread bars penetrate easily. On hard ground or dry turf the tyre pressure should be increased to prevent distortion of the casing between the lugs. When a tractor is changed from field work to road work tyres should be re-inflated to about 20 lb. Some traction may be lost, but tyre life is extended.

When one tyre is to be continuously in the plough furrow or on the lower side of a hill the tilt of the tractor subjects the side wall of that tyre to severe thrust. This side-wall pressure, combined with the load of the implement, causes the inside of the tyre to wrinkle, giving similar effects to under-inflation. To correct it the pressure in the tyre should be increased by about 4 lb. When both tyres are being subjected to heavier loads or hillside work inflation should be increased accordingly, but the pressure should never exceed the maximum recommended. A hand pump, power-take-off pump, or spark plug pump can be used to add a few pounds of air needed to bring tyres up to the recommended pressure.

Correct pressure in rear tractor tyres is critical, as they carry a heavy load and transmit terrific drawbar pull. **Rear tyre pressures should be checked at least twice a week** when the tractor is being used. They should still be



Use of the wrong tyre tool has damaged the beading of this tyre. Moisture has entered, rusted and enlarged the steel wire, and destroyed the fabric covering. This tyre is beyond repair, yet a few minutes' care in servicing could have prevented the damage.



Cuts on side wall due to tyre striking an obstruction while under-inflated. Breaks are beginning to form at the base of each lug. Wheel spin has cut the leading edges of the tread bars. This tyre is a typical example of misuse and abuse.

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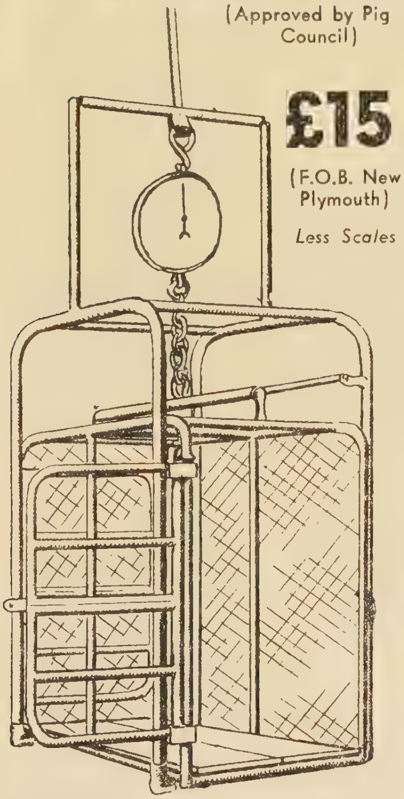

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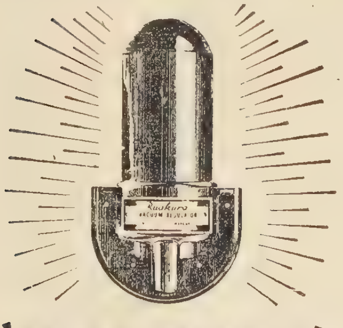

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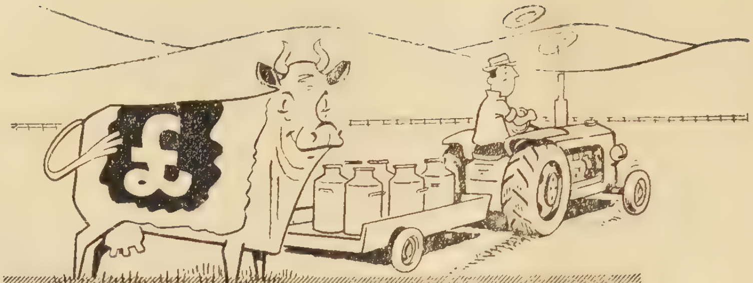

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checked when it is not working or the tyres should be blocked up. A low-pressure gauge is needed to get accurate readings. It should be checked occasionally for accuracy against another one. Special gauges are also available for testing water-filled tyres. Air pressures should be adjusted when the tyres are cold. Air pressure builds up as tyres get warm and tyres seem to be over-inflated. Tyre construction allows for this extra pressure, and if it were bled off when a tyre was warm, the tyre would be under-inflated when it cooled off.

Valve caps should be used, as they keep dust and dirt from entering the valve stems. These cause damage to the valve and consequent loss of air.

Over-inflation of tyres does not compensate for overloading, because it does not add strength to the tyre; actually it weakens the tyre by reducing its ability to absorb shocks.

The casing is subjected to strain on the inside, the cords are stretched, and they lose much of their tensile strength, making them too weak to resist impact breaks. When rubber is under tension it is susceptible to cuts. The tread contact with the ground is reduced, causing wheel spin, side slips, and consequently increased tread wear, especially on the centre line of the tyre tread and the leading edge of the tread bars.

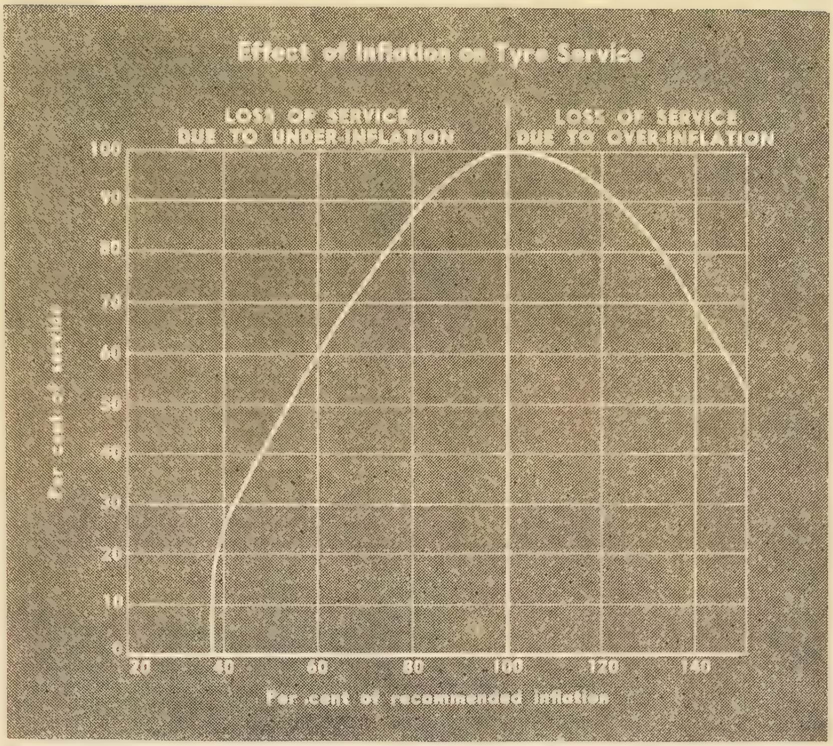
Less ground contact through over-inflation gives less flotation, poor traction, and consequently reduced power. Ground shock is not absorbed by the tyre; it is transmitted to the tractor and to the operator, increasing fatigue of both metal and man.

When a tractor is to be heavily loaded larger tyres should be selected to support the weight and should be operated at their recommended pressure.

Effect of Water on Tyres

As tyres cut much more easily when the rubber is wet, spinning of the wheels in water or mud should be avoided. Water also quickly weakens and destroys the cord fabric in tyres. When a puncture is repaired the tyre and tube should be wiped clean and dried before being mounted.

Special processes of gum dipping and various types of fabric material have been developed to reduce the damage by water, but once moisture or farmyard acids have access to the fabric of the tyre its life will be rapidly reduced unless it is repaired by vulcanising to seal the fabric away from such corrosion.



Operational Care

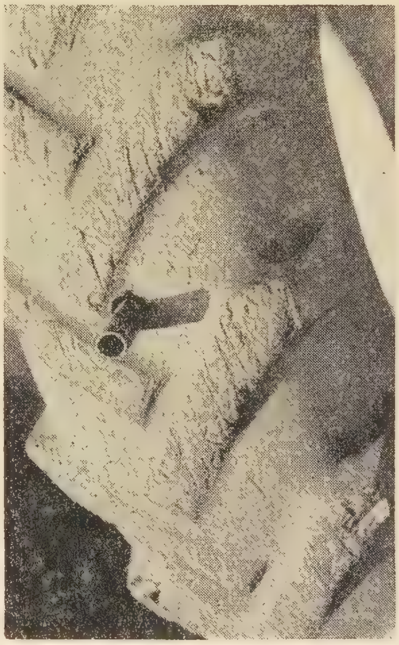
Most objects that damage tyres can be avoided by careful driving. Reduced speed over rough areas and avoidance of sudden rises, ditches, stones, or stakes will pay handsomely. Brakes should be used intelligently; their sudden application both wastes rubber and creates a strain on tread bars and tyre casings.

Continued pivoting on one wheel causes distortion of the tyre body, which may loosen cords and separate the ply. Sharp turns also tend to twist objects into the tread. Rubber tyres should not be run against banks, stakes, or obstructions that might damage the side wall or cause a diagonal break across the tyre as it strikes a barrier.

Oil, Grease, and Sprays

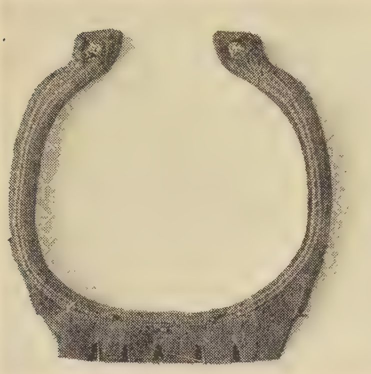
Mineral oil in any form—vapour, liquid, or hard grease—is destructive to rubber. If oil spills on to a tyre or the tyre runs through a pool of oil, it should be wiped off quickly before the oil has a chance to start deterioration of the rubber. Petrol or kerosene should never be used to clean a tyre. A rag, sawdust, or sand will absorb the oil and assist in cleaning.

Sprays containing copper or solvents should be kept off the tyres. After the tractor has been used for spray work the tyres should be hosed to clean off any spray residue.



The effect of wheel spin is clearly shown on this tyre. Not only have cuts been made across every tread bar, but large hunks of rubber have been torn from the shoulders of the tyre. Finally, a stab through the centre has ended the abuse of this tyre.

PROPER INFLATION



Ensures the long life the tyre was designed to give.

Requirements:

Correct inflation pressure only when tyres are cool.

Check tyres regularly and often.

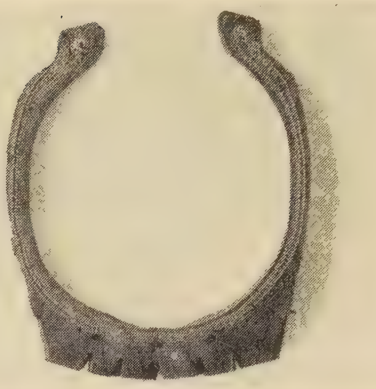
Repair leaks and punctures promptly.

Keep any change in air pressure within the recommended range.

Never bleed tyres to relieve build-up due to warmth or working.

Use a tyre of the size and type that has the capacity to do the work effectively.

OVER-INFLATION



Does not compensate for overloading; reduces the tyre's ability to absorb shocks.

It causes:

Rapid wear in the centre of the tread.

Increased tendency to bruises and breaks.

Excessive strain on beads and rims.

Tyre expansion, tread stretch, and cracks.

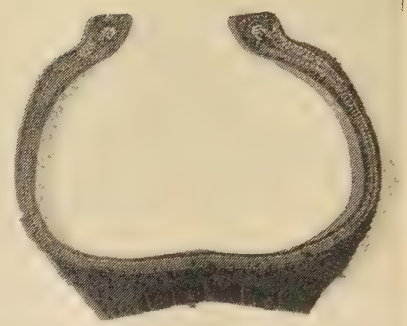
More cuts and snags to side wall rubber.

Reduced cushioning, harder riding.

Higher upkeep costs for tractor.

Reduced ground contact and traction.

UNDER-INFLATION



Damages the tyre casing by repeated folding and buckling of the side wall area.

It causes:

Excess tread wear on shoulders.

Irregular, uneven tread wear.

Breaks to form at base of tread bars.

Excessive heating, causing ply separation.

Tendency toward rim bruises.

Wheel spin in tyre, which may rip off valves.

Scraping off of trailing edges of tread bars on hard roads or highways.

A danger to hands and eyes: A mushroom-headed cold chisel being used during the removal of a tyre.

Inspection

Tyres should be inspected regularly for possible injury, which will need specialised attention. When such damage is found the tyre should be taken to a competent tyre serviceman for vulcanising. Most tyres can be repaired economically. Scuffs, cuts, and breaks that expose the fabric or enter the cords of the tyre should be repaired as soon as possible before moisture and foreign matter enter to cause deterioration that makes reconditioning of the tyre impossible.

When a cut or snag extends into a rubber lug or tread bar but has not reached the tyre cords, bevelling any loose material and rounding the base of the tear will prevent its tearing further or collecting other matter which might work into the cords. When tyres are removed for any reason the inside should be inspected for imbedded tacks, nails, or other metal that may have been picked up.

Water-filled Tyre Tubes

There is probably no better way of weighting a tractor than by using water ballast. In cold climates sufficient calcium chloride should be added to prevent the water from freezing; 2½ lb. of calcium chloride per gallon of water will prevent slush forming in tyres at 12 degrees F. (20 degrees of frost) and keep from freezing hard up to —20 degrees F. When ice forms in a tyre the expansion creates very great strain on the cords, causing them to stretch and break. The tyre will then be useless.

A tyre three-quarters filled with water and one-quarter with air will require inflation more often to maintain safe working. Tyres completely filled with water do not have to be checked as regularly and can be run at slightly lower pressures than normal; the added weight reduces wheel slip. Usually these tyres must be filled by tractor servicemen, because the farmer seldom has the necessary equipment. They must be run more slowly and with greater care. If they strike an obstruction, they have no cushion of air to absorb a serious shock and are more likely to be damaged.

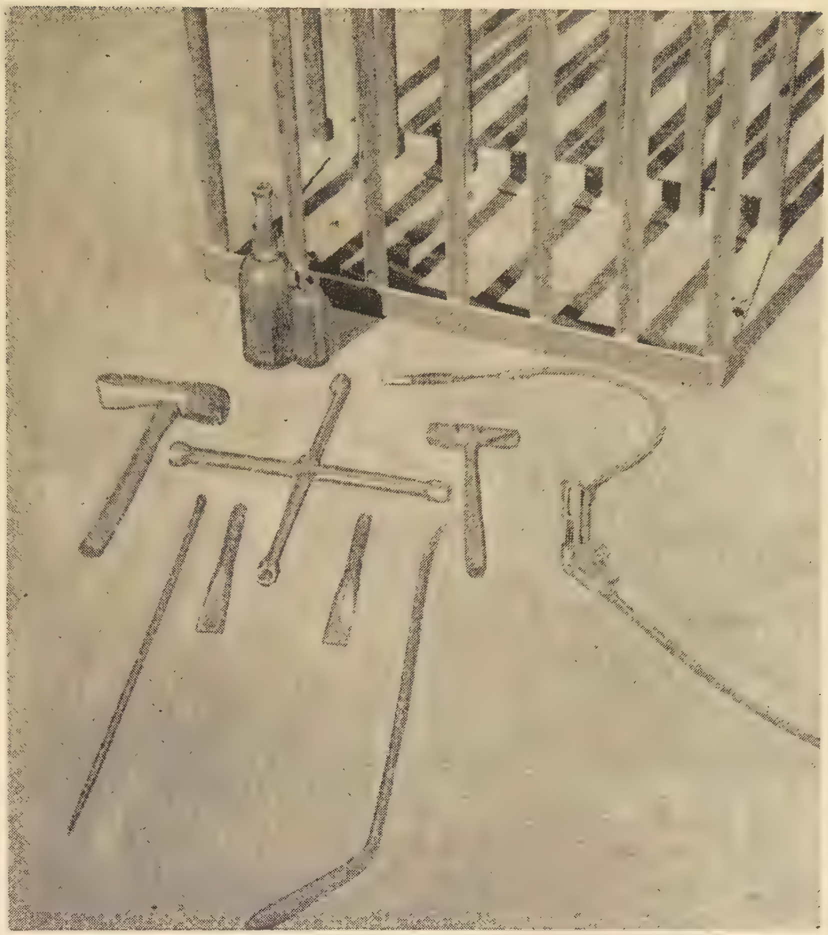
Belt Work

As static electricity can build up when the pulley on a tractor engine is used to drive a belt (because of the insulating effect of the tyres), the frame should have an earthing wire attached. A further precaution is to watch that the belt does not cut into a front tyre. This can be prevented

Tyre Safety Rules

- A person removing the valve stem from a tube should keep his head clear of the issuing stream of air, because small bits of grit or earth can easily be blown into the eyes.
- Proper levers and a heavy rubber hammer make removal or replacement of tyres a much less difficult job, reduce the likelihood of injuring hands, and prevent pinching of the tube, scuffing of the beading of the tyre, or bending of rims.
- When the tyre is being inflated the tyre serviceman should stand to one side to avoid injury should the tyre blow off. High pressures (35 lb. or more) are needed to seat the tyre beads against the rim; the tyre should then be deflated, so that the tube fits into its proper place, and again inflated to the recommended operating pressure.
- The use of excess amounts of tyre soap, sometimes applied to assist tyre fitting, can cause a tyre to spin on a rim. Tyres should be fitted only to clean, smooth rims. Make sure the beading is well seated against the rim.

This tyre is in a cage because it is dangerous. Tyres or wheel rings have often blown off and seriously injured or killed a serviceman when he inflated the tyre to a high pressure to site the beading on to the rim.



Some of the tools needed for satisfactory servicing of tyres. Good tools reduce the danger of injury to both man and tyre.

by blocking the left wheel up so the right wheel is tilted outward, or a hole can be dug in the ground to lower the right wheel below the belt. Stakes can be placed along the belt to prevent it from swaying against the tyre, or a sheet of iron can be bent over the tyre to shield it from the belt.

Laying up a Tractor

A tractor or other rubber-tyred machine to be out of use for several weeks or perhaps months should not be left standing on the tyres out in the yard or paddock; it should be brought inside and jacked up. The tyres should then be checked for any necessary repairs and made ready for use in the next season. If a tractor is to be used again fairly soon, water-filled tyres need not be drained; they should be raised on to a clean board and support only their own weight. Before the tractor resumes working the tyres should be reinflated to the recommended pressure.

These simple precautions will save tyres from deformations which cause uneven tread wear. Permanent folding of the side wall causes breaks to form in the cords and reduces the life of a tyre markedly. Tyres allowed to go flat under the weight of a machine are ruined in one season.

Storage of Tyres

Tyres should be stored in a cool, dry place out of sunlight and preferably in the dark. They should be protected from ground moisture and rain that might get inside the tyre and affect the casing fabric. They should never be stored near petrol or other material which gives off fumes corrosive to rubber.

Ozone given off from the armatures of electric motors with badly sparking brushes causes rubber to crack. Sunlight, heat, or static electricity also causes surface deterioration and other damage. If new tyres or tubes are not to be used for some time, they should be left wrapped.

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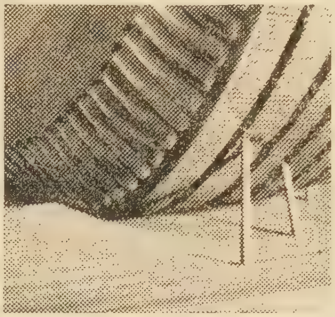
- Costs no more than regular tyre and tube.
- Punctures easily repaired.

No tube to blow out — safe, "s-s-s-slow-outs" instead, giving time to stop safely



2 REIDRUBBER
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- Guards against skids.
- Seals its own punctures permanently.

New Zealand's only genuine self-sealing tyre — instantly and permanently seals its own punctures.

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Part of Fruitgrowers' Federation in

Organisation of Fruitgrowing and Marketing

DIFFICULTIES experienced in the early years of establishment of fruitgrowing in New Zealand have been reviewed in a series of articles on the history of the industry in several districts that have appeared in recent issues of the "Journal". That many of these difficulties were eventually overcome was due to the establishment of the growers' own cooperative organisation, the New Zealand Fruitgrowers' Federation Ltd., the history of which is given in this article.

DURING the early 1900s, the conditions under which fruit was grown and marketed in New Zealand made commercial orcharding a precarious business, and unsatisfactory to a degree that caused growers in the various orchard districts to form local societies, associations, and cooperatives with the object of improving the position.

However, the well intentioned action of these bodies was necessarily limited in its influence, and any benefits were invariably restricted to local application. This, together with forebodings as to likely conditions when the then increasing acreages of fruit trees came into production, made obvious to growers that throughout New Zealand they should be unified in an authoritative, all-embracing organisation.

The outcome was the formation in 1916 of the New Zealand Fruitgrowers' Federation Ltd., which was constituted and registered under the Industrial and Provident Societies Act 1908. The federation has fostered and developed the spirit of cooperation on which the present stability and well-being of the industry are based.

The federation was the first organisation in New Zealand to seek self-taxation to ensure the revenue necessary to its development.

The Orchard Tax Act 1916 imposed on all occupiers of orchards a tax to be collected by the Horticulture Division of the Department of Agriculture on an acreage basis. After deduction of the cost of collection the money was to be devoted to the cost of developing the federation as a producers' organisation and defraying expenses of the annual conference and federation executive meetings.

Though the original act was amended, added to, and then in 1954 superseded by the Orchard Levy Act, which is now collected by the federation, the principle of the original statute remains unaltered.

Objects and Constitution

The objects of the federation are broad in their intention. All, however, are closely allied with primary production, as is shown by the following extracts:

> "To engage in any trade or business dealing with fruit or any other products of the soil."
>
> "To buy, sell, or distribute anything which may be of use to fruitgrowers."
>
> "To promote, foster, and protect the fruit industry throughout New Zealand and to establish a closer bond of unity and cooperation among all engaged in the production of any kind of fruit or any other products of the soil."

The New Zealand Fruitgrowers' Federation is completely cooperative and, with its shares held by 30 affiliated fruitgrowers' associations, it is the only national organisation authoritatively representative of all classes of fruit producers.

From a fruitgrowing aspect New Zealand is divided into six provincial districts: Auckland, Hawke's Bay, Nelson, Marlborough, Canterbury, and Otago. Each elects to the federation's directorate a bona fide fruitgrower from its own district. A director's term is 3 years. The board elects its chairman annually.

Each year conferences, over which local directors preside, are held in the respective provincial districts. These local conferences select the delegates to the annual Dominion conference of the federation. Resolutions from this conference are passed to the directorate of the federation for implementation.

Trading

In its early days the federation was concerned with organising growers and collecting and distributing information for their benefit. Later, cooperative trading in fruitgrowers' essential commodities was developed.

From a modest beginning, business steadily increased until it became necessary to open branches at Auckland, Nelson, Hastings, Motueka, Christchurch, and Roxburgh and later at Blenheim and Alexandra. An office was established in London in 1954. The organisation's trading has been built up from £2,000 for its first year (1920) to a total considerably in excess of £1,500,000 per annum. Accumulated funds exceed £100,000 and some £200,000 has been disbursed in rebates to growers.

Fruit Tree Nursery

With the object of making available to fruitgrowers trees of the highest quality, true to name, and on reliable rootstocks the federation acquired, in 1943, 10 (later increased to 19) acres of farm land at Levin, near Wellington, and established for the industry a fruit tree nursery. Bud selection committees comprising federation and Departmental research and field staff were established in the main fruitgrowing districts to select trees of varieties apparently true to type and disease free. Samples of fruit from these trees are forwarded to the Plant Diseases Division, Department of Scientific and Industrial Research, for identification. Trees approved by the Division are labelled and budwood is taken from them for the nursery.

In this way growers are assured that the budwood used in raising trees for them is true to type. To date, considerably more than half a million trees have been grown and dispatched to growers.

Because of the nursery's steady growth to meet orders and its importance to the industry it became necessary recently to establish it in a larger and permanent site on a 50-acre property not far from the original block at Levin.

Marketing

From 1920 the federation began to develop the export of pip fruits from New Zealand and in 1925 it sought controls over export marketing. These were embodied in the Fruit Export Control Act 1926, under which the Fruit Export Control Board was set up and took control of all exports of pip fruit.

Until 1935 the federation acted as agents for the board, doing all assembly, shipping, and administrative work. In 1935 the board set up its own office and continued to control the export of fruit until war broke out in 1939, when the impossibility of obtaining refrigerated overseas shipping space for fruit created a serious situation in the industry. The Government therefore agreed to purchase the whole of New Zealand's pip fruit crop at a fixed price and the Fruit Export Control Board went into recess. This arrangement continued until 1944, when the federation made an arrangement with the Government for a guaranteed minimum price for each season; realisations above the price were paid to growers.

A marketing advisory committee, known as the Fruit Marketing Council, on which the growers were represented, was associated with the Internal Marketing Division in the handling of the crop. The Dominion conference of the federation for some years urged that there should be a suitable scheme of orderly marketing for pip fruit and the federation repeatedly negotiated with the Government for this.

In 1948 a joint committee comprising fruit industry and Government representatives was set up to clarify outstanding issues and to draft proposals. The Government's subsequent acceptance of a sub-committee's assessment of a standard cost of production cleared the way toward a statutory marketing scheme and the Government advised the federation of proposals which it was prepared to introduce as legislation. These proposals were considered by the industry at provincial conferences and the 1948 Dominion conference asked for certain amendments and after further negotiation the Apple and Pear Marketing Act 1948 was passed. Under this Act the New Zealand Apple and Pear Marketing Board was established.

At that stage, however, the board did not have sufficient staff, premises, or facilities for handling the new season's crop. At the board's request the Minister consented to the Marketing Department acting for 2 years as the board's agent. This arrangement continued until 1953, when the board purchased the department's fruit handling assets and took over assembly, cool storage, and marketing of the whole of New Zealand's pip fruit output.

Cost of Production

The federation annually revises the cost of production, using as a basis figures from the original cost of production survey. The price calculated, after being approved by the Government, constitutes the overall price at which the board purchases fruit from growers. The actual prices paid to individual growers is varied by the board according to varieties and grade. But the average payout over the whole crop must be the same as the assessed cost of production.

Section 6 of the Apple and Pear Amendment Act 1954 provides for payment to growers of a share in the board's profits from year to year, subject to certain conditions relating to the board's reserve fund. The board sets prices on the wholesale markets in New Zealand but has no control over retail prices.

Stone and Citrus Fruits

The New Zealand Apple and Pear Marketing Board, as its title signifies, is concerned only with the marketing and distribution of pip fruit. Stone fruit is sold by auction and privately, the growers being responsible for its transport to markets or individual customers.

New Zealand-grown lemons and sweet oranges are marketed by the Citrus Marketing Authority, a body consisting of 4 growers and 1 Government representative. Except in certain circumstances, other citrus fruits are sold on the same basis as stone fruit. In recent years production of subtropical fruits such as tree tomatoes, Chinese gooseberries, and feijoas has increased. Some of this produce is exported, but the bulk is disposed of in New Zealand by private sale and auction.

Though not directly concerned in the marketing and distribution of fruit, the New Zealand Fruitgrowers' Federation Ltd. is vitally interested in the protection and welfare of growers of all types of fruit. But while using its influence in their interest, the federation has constant regard for the rights of consumers.

Pre-conditioned Soil for Greens Renovation

By C. WALKER,
formerly Assistant Fields Superintendent, Department of Agriculture, Palmerston North

ON all fine turf playing areas groundsmen have the problem of renovating worn turf at the end of the playing season. In bowls, tennis, and cricket damage at the ends of the playing area can be considerable and may call for building up with new soil and resowing.

THE great problem in this work, apart from obtaining suitable soil, is to establish a fine turf that is reasonably free from unwanted plants such as weeds, clover, and *Poa annua.*

Generally, by the adoption of acid manuring (usually topdressing with sulphate of ammonia and superphosphate in the proportions of 3 to 1 by weight), it is possible to develop a soil acidity of pH 5.0 or slightly lower in which undesirable plants will not flourish, but in which fine turf species can be maintained in a vigorous condition.

If soil of pH 5.6 or higher is introduced during renovation, even though the added depth is as little as ⅛ in., weeds, clover, and *Poa annua* may establish and thrive to the detriment of the fine turf species.

Pre-conditioning

At Milson Experimental Area this problem has been tackled in recent years by pre-conditioning of the added soil. Various rates of sulphur were thoroughly mixed with selected topdressing soil in November. The mixture was kept slightly damp to activate the sulphur and was turned once a month until required in March-April.

It was found that as little as 5 lb. of sulphur per cubic yard of soil would reduce pH from 6.2 to 5.0 in 5 months. The soil used was a silt loam. With lighter soils slightly less sulphur might be sufficient, while for clay loams a little more could be used, but for general purposes 5 lb. of sulphur per cubic yard could be recommended.

Subsequently seed was sown on a prepared seedbed, a portion of which was covered with ¼ in. of untreated soil and the rest with the same depth of treated soil.

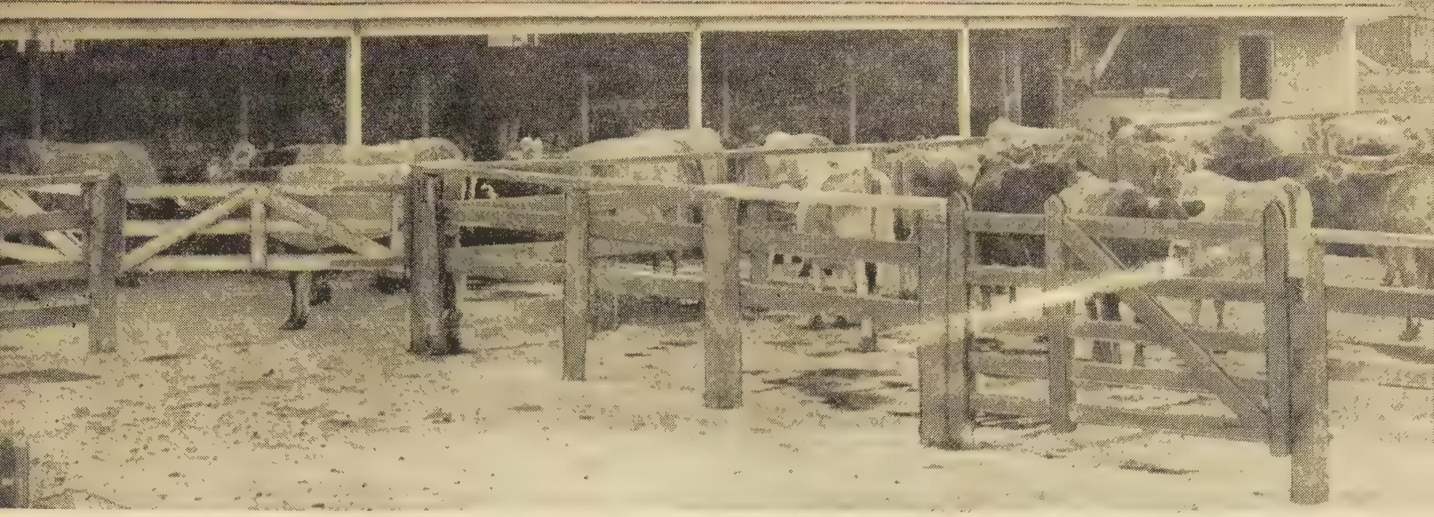
The development of fine turf species on each was very good, but, whereas many weeds, *Poa annua*, and clover established and competed with the fine turf where untreated soil was used, these plants were almost absent where the covering soil was pre-treated with sulphur.

Sulphate of Ammonia

In practice sulphate of ammonia at a rate of 10 to 12 lb. per cubic yard of soil could well be used in place of sulphur. The same procedure of mixing in advance should be followed. It is suggested that soil should be obtained in November to January, screened as usual, and sulphate of ammonia added during screening. The mixture should be turned periodically until required on the playing areas. Such soil would need to be kept under cover.

By using sulphate of ammonia acidification would be hastened, the fertility of the soil in nitrogen would be raised, and the establishment of a relatively clean turf would be assured.

Greenkeepers have nothing to lose by adopting this method of pretreating soil, as all the sulphate of ammonia used will go back on to the greens where it is most required, and it will enhance the prospects of getting good weed free turf at the outset.



Farm Hygiene and Tuberculosis in Dairy Herds

By A. FISHER,
Veterinarian, Department of Agriculture, Papakura

SO often is a high incidence of tuberculosis in dairy herds correlated to unsatisfactory conditions in milking sheds, yards, and general farm hygiene that officers regularly tuberculin testing can assess fairly accurately before a first test is done on a farm what the percentage of reactors is likely to be. Attention to the improvement of factors that influence such assessments—design of the shed, its ventilation, and the size of holding yards in relation to the size of the herd—could therefore do much toward effective control of the disease.

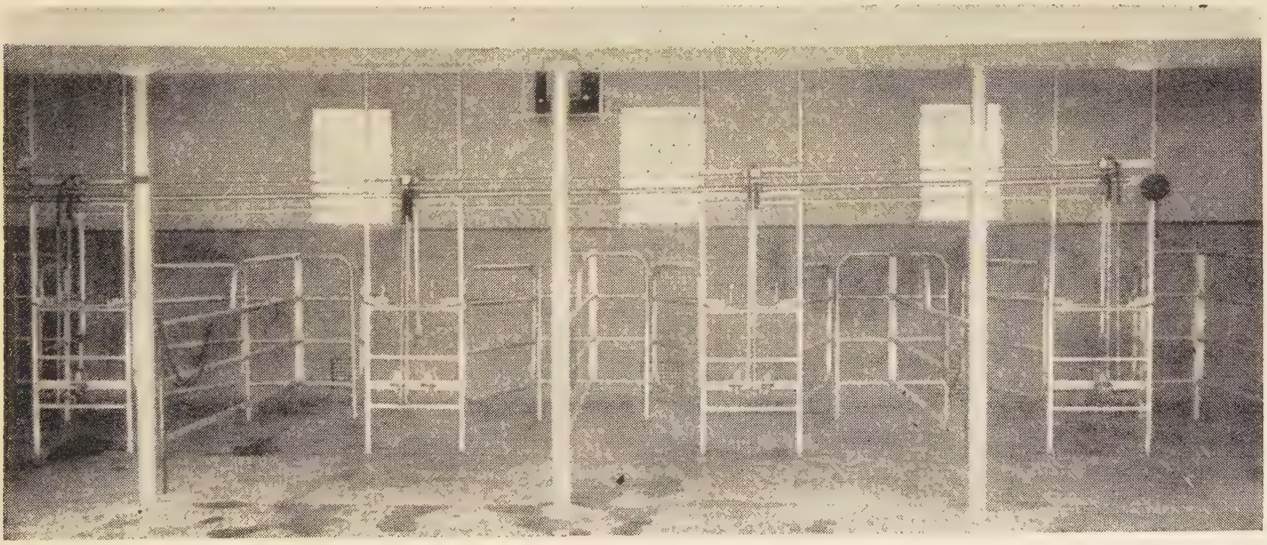
TO understand why these factors are important it is first necessary to explain how tuberculosis is spread. The two main methods of infection are by inhalation (breathing) or ingestion (swallowing). The infection is inhaled either in infected, dust-laden air or air contaminated with infected droplets because of close proximity to an infected cow. It is swallowed principally by eating contaminated feed or drinking contaminated water.

When inhaled the infection can be sited on the lung tissue or if it is trapped by the moist mucous lining of the upper respiratory tract, it may develop in one of the lymph glands of the head.

Once the tubercule bacterium lodges in the tissue it starts to multiply slowly and the reaction of the body defence mechanism is such that a fibrous wall is developed round the organism in an attempt to localise the trouble. If the disease lesion is examined, it looks like a round white capsule containing a material resembling soft cheese. Sometimes this develops close to the wall of one of the thousands of air passages of the lung and may rupture into the passage, in which case the irritation leads to coughing to clear the passages. Thus the disease is passed on. Occasionally the lesion (or tubercule as it is called) may rupture into a blood vessel, in which case the bloodstream disseminates bacteria far and wide over the body, and tubercules develop in multiple sites. Such a condition is called miliary tuberculosis, or galloping consumption, and a rapid decline in health sets in.

The area incidence of tuberculosis in town supply dairy cattle increases from 0.6 per cent in the far south to nearly 8 per cent in the north, as

HEADING PHOTOGRAPH: An example of good yarding. The cows have enough space and stand quietly.



↓ An internal race shed. There is a minimum of obstruction in front of the bails to trap infection.

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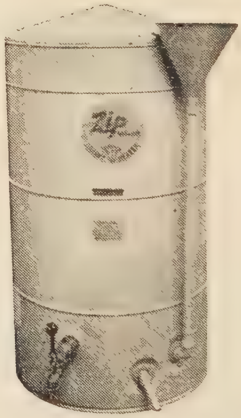

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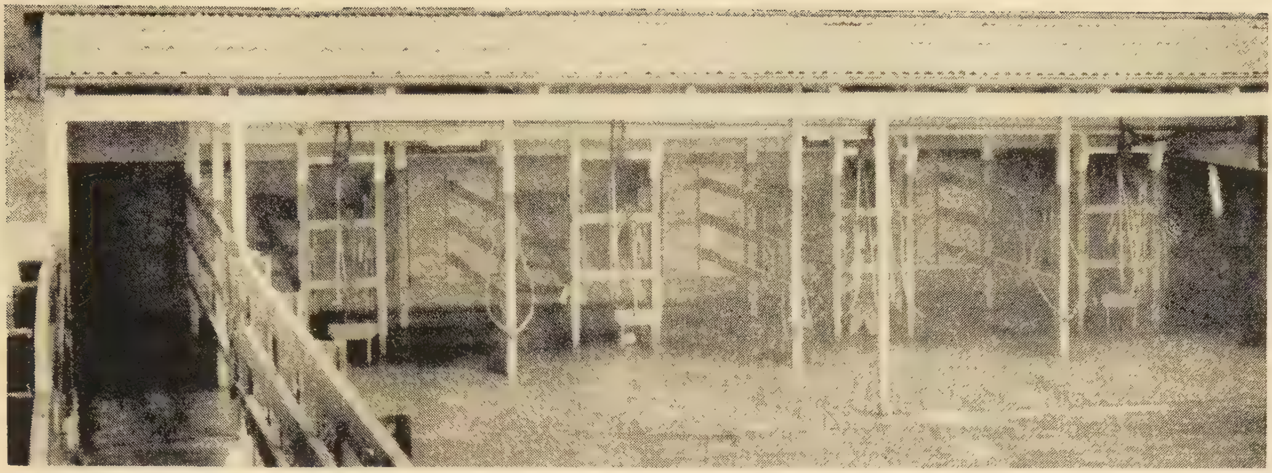


Internal race shed spoilt by boarded-over front of bail.

shown in initial testing records. Incidence is higher in dairy cattle than in beef cattle, mainly because a dairy herd is yarded twice daily for a greater part of the year, a 500-fold increase in the effective population density. Until the national eradication scheme gets under way losses of valuable stock from tuberculosis can be reduced by attention to the factors now to be discussed.

Size of Holding Yard

The use of a small yard means that cows have to be packed in like sardines in a tin. These conditions are ideal for transmission of the disease by inhalation. (An extra factor with cows so closely confined is that horned cattle can cause a lot of injuries.)

A yard that is too large permits too much movement and cows tend to segregate into social groups, particularly if the cattle are nervous and crowd into the back of the yard. Such packing is often worse than if a small yard is used. A placid temperament on the part of the milker will usually go a long way toward building up a trust between man and animal, and a placid herd will disperse itself evenly over the yard.

Tuberculin Test

The tuberculin test in New Zealand is known as the single intradermal test. An injection is made into the skin of one of the folds beneath the root of the tail, and 96 hours later this fold is examined for a swelling at the site of the injection (called a reaction).

Town supply cattle are identified by consecutively numbered metal eartags at the time of injection. It has been noticed repeatedly that a group of reactors will have consecutive eartag numbers, indicating that they entered the bails as a social group for injection and tagging, and again 4 days later as a group for examination for reaction to the test. These groups tend to congregate all the time, and if one of the group has tuberculosis, it is not long before the others are infected. If one of the group enters a bail, the others tend to follow. It is these groups that tend to crowd in a large yard.

The Ideal Yard

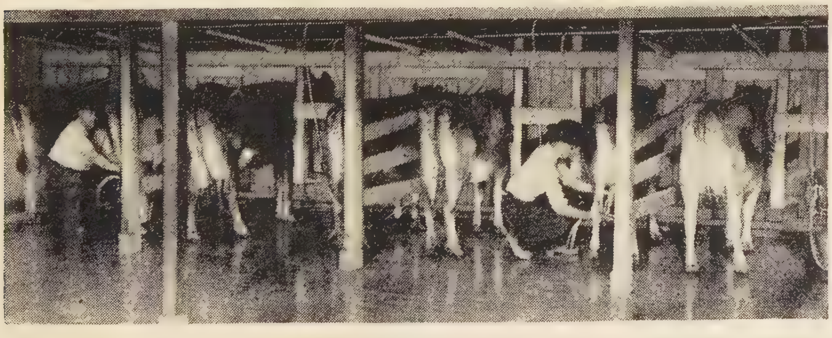
The ideal yard is determined by local conditions. The aim should be to allow plenty of movement in the yard and yet retain for practical milking an amount of crowding consistent with the temperament of both cows and milkers. As a working basis allow 20 sq. ft. per cow or a yard 20 ft. x 40 ft. for 40 cows. Two yards may be necessary for a herd of over 60 cows.

The Type of Bail

The modern type of tubular steel bail is obviously the most hygienic, because it has a smooth metal surface and no cracks, such as in timber, to retain dirt and infection. Most tubular steel bails are fitted in sheds with an internal race allowing plenty of breathing space ahead of the cow. Usually there are two short pipes across the front and these are easy to clean and are not likely to retain as much residual infection as, for instance, a wooden door.

The walk-through type of bail with a door opening in front is to be avoided. Cows can often be seen with noses resting against the door, which is wet with nasal mucus and saliva. This contaminating material unless thoroughly washed off will dry and float about as dust. As a cow spends about 62 hours a season standing in the bail inhaling dust off these doors, as well as the contact of her nose with the infected surface, they are quite a menace.

Where it is not possible for economic reasons to alter a door-type shed, at least try to line the interior surface of the door with a smooth material such as flat galvanised iron and pay particular attention to the cleaning of the doors. If they are hinged so that when open the interior surface is shaded all day, try to alter the race and change the hinges so that the interior surface of the opened door is exposed to the sun. Sunlight and dryness are the natural enemies of tuberculosis bacilli. After a tuberculin test of the herd clean the doors to remove any infection that may remain and after cleaning flame them lightly with a blowlamp.



[*National Publicity*

Door-type shed. The cow's head is only inches from the door, which can retain tuberculosis infection. As sunlight and dryness are the natural enemies of tuberculosis bacilli, doors should be so arranged that the interior surfaces can be exposed to the sun.

Shade Trees

If trees shade the shed and yards during the day, they are better removed. The morning sun should be

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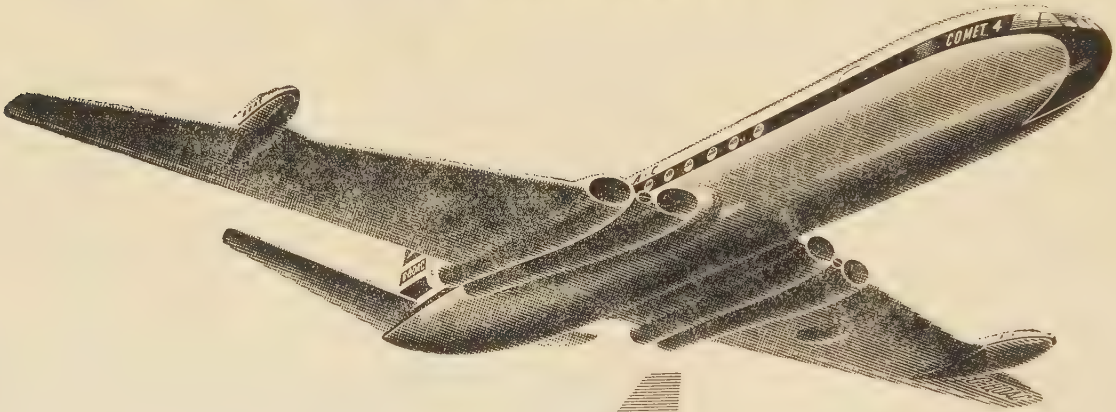

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In the older door-type shed the doors should open so that their internal surfaces are exposed to the sun.

able to flood the yards and as much of the interior as possible. Trees should be planted to the south as shelter from cold winds. Bacteria can survive a good deal longer in shade and damp. Normal ventilation should dry out the shed interior.

Washing

In most sheds equipped with rotary pump and high-pressure hose little trouble is experienced in keeping sheds and yards clean. There is a tendency for dirt and slime to collect beneath dummy bails, particularly where bail feeding is practised. This area is subject to considerable contamination and it should not be neglected.

Shed drainage should always flow away from the milk room. Avoid running drainage down a race, as it creates a mire through which cows churn four times daily. Do not allow stagnant water to lie in the fields. A thirsty cow will sniff or drink at it and such water can be a grave risk.

Bail Feeding

Bail feeding is necessary in winter in many town supply herds to keep up the milk quota. It should be avoided if possible until tuberculosis can be eradicated from the herd. Until then strict hygiene should be practised. Boxes, where necessary, should be of metal, easily removable, and thoroughly cleaned after each milking and stood in full sunlight during the day.

Lick boxes are as dangerous as feed boxes where tuberculosis is present in the herd.

Water Troughs

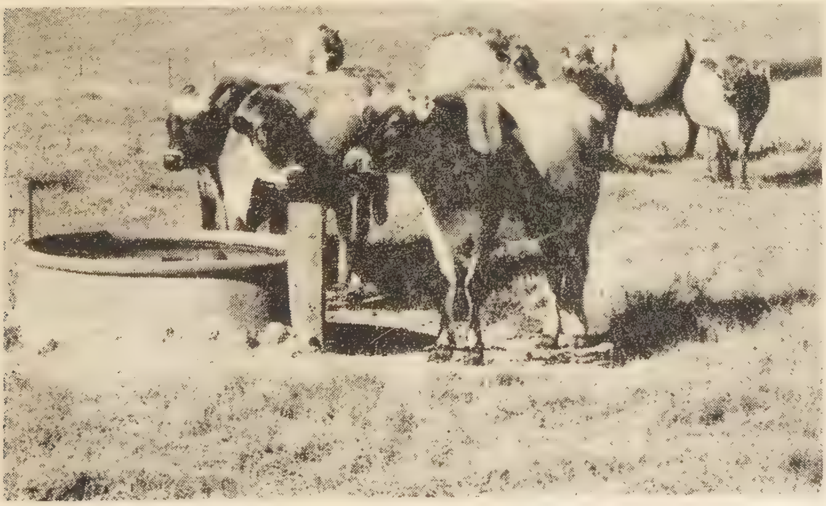
Water troughs should be emptied and thoroughly cleaned fortnightly, or more often if possible. A light but thorough flaming with a blowlamp is a wise precaution after reactors to the tuberculin test have been removed from a herd.

Disposal of Carcasses

A carcass of an animal that has died of tuberculosis may contain viable bacteria in the bones for up to 5 years. If such a carcass is lying in swampy water, it is very likely that tuberculosis bacteria will contaminate the water. Stock are most likely to forage for water in swampy land in dry summers, when the water is stagnant.

Carcasses should be boiled down for fertiliser, burnt, or buried at least 3 ft. deep.

It is an offence to leave any carcass within ½ mile of a highway or to dispose of carcasses into waterways or streams.



[*National Publicity*

Fortnightly or even more frequent emptying and cleaning of water troughs is essential in tuberculosis eradication.

Calf Management

The rearing of tuberculosis-free herd replacements is extremely important. Tuberculin testing has often shown infection in calves, the majority of which are infected by tuberculous milk from the dam. A calf may be born with tuberculosis, if for instance there is tuberculous infection of the uterus of the mother.

If the herd is not free of tuberculosis, farmers are well advised to rear calves on powdered milk as recommended in Bulletin No. 228, "Good Rearing of Dairy Stock". It is good economy to build up a supply of tuberculosis-free young stock in this manner to ensure healthy stock to replace reactors that may be condemned at a herd test. Even if a herd test is not contemplated, the incidence of tuberculosis in a herd can be reduced considerably by constantly culling suspected cows, or even culling for age, and replacing with heifers that have been reared tuberculosis free; that is, fed on powdered milk and isolated from the rest of the herd until calving.

Replacement Animals

Once the herd is free of tuberculosis it is most important to avoid a re-entry of infection. Replacement animals should not join the herd until they have been tested and shown to be free of tuberculosis. An isolation paddock for this purpose should be a part of every dairy farm. If one of a group of replacement animals reacts to the test, it is advisable to isolate the rest of the group for a further 3 months and place them with the herd only after a further test.

Boundaries

Infection may occur from neighbouring stock. This does not often happen, but it is a possibility. For this reason a good, thick hedge along the boundary is well worth the trouble of growing it.

The factors discussed show why one man may have a high incidence of tuberculosis in his herd while his neighbour's stock may be only lightly infected.

A cow with tuberculosis may be removed and slaughtered, but objects contaminated by her remain and can infect other animals. This fact cannot be too strongly stressed.

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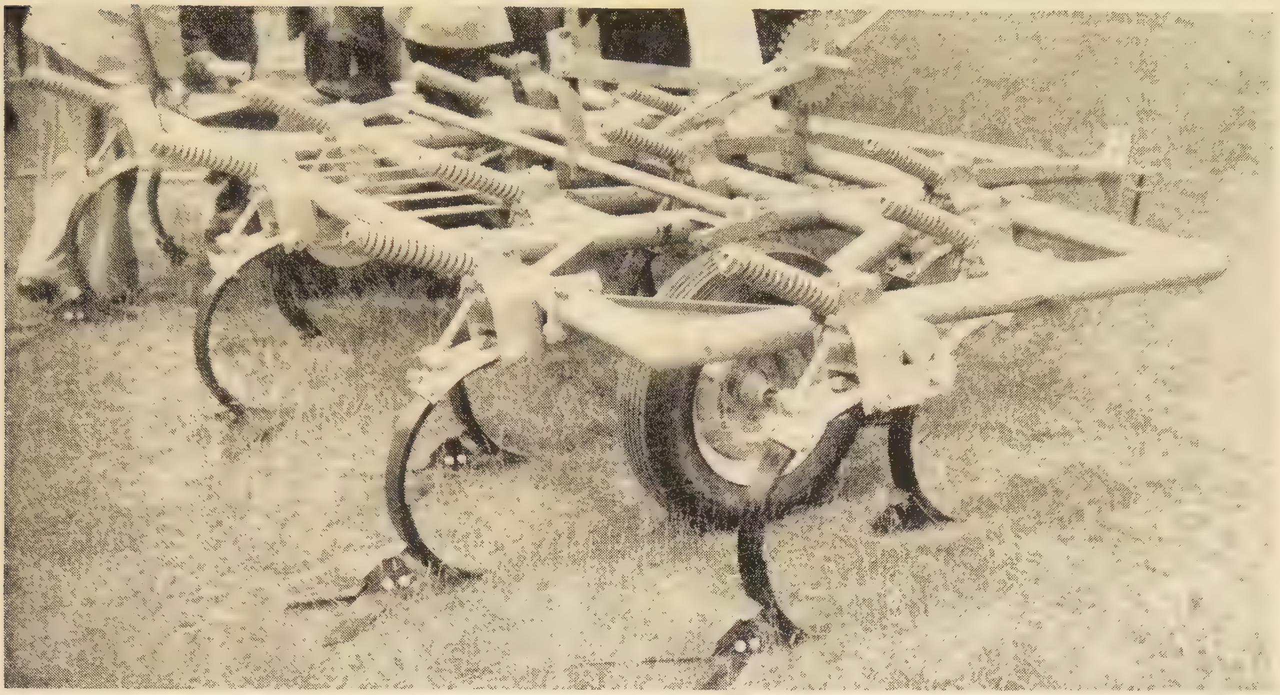
Chisel Plough Aids Soil and Water Conservation



▲ The chisel plough. The tines are made of special steel to reduce breakages, are spaced 12 in. apart, and can be either fixed or fitted with stump-jump release attachments. The double-ended chisel points can plough to a depth of about 8 in.

By R. V. MAXWELL,
Soil Conservator, Department of Agriculture, Kurow

THE value of the chisel plough for soil and water conservation has been very well demonstrated on the property of Mr J. Watherston at Otiake, near Kurow. Annual rainfall in this area is about 18 in. and is badly distributed, so that droughts of several months' duration are not uncommon. Temperatures are high in summer and low in winter with numerous frosts. Frequent strong north-west winds are also a feature, and their desiccating effect further intensifies the dryness of the locality caused by the low and variable rainfall. As a result the establishment of sown crops and pastures is often restricted by inadequate soil moisture.

CONSIDERABLE run-off sometimes takes place when heavy rains follow dry spells, especially on slopes facing to the north. At such times the surface of the soil is usually baked hard by the sun and north-west winds and the plant cover is thin and open owing to lack of moisture, these conditions resulting in a low rate of moisture infiltration.

Effective on Steep Country

The property consists of steep ridges and sidelings as well as gently sloping terraces, and it is on the steeper country that the effectiveness of the chisel plough has been most convincingly shown. Cultivation is also impeded by large boulders, some of which are buried.

Cultivation is required for pasture renewal and production of fodder crops. Before the chisel plough was acquired a number of implements were used for seedbed preparation, which was difficult owing to the steepness and roughness of the country. The heavy mouldboard ploughs, discs, and cultivators then in use were frequently damaged through striking concealed rocks or capsizing on steep slopes, resulting in time lost on repairs and considerable expense for maintenance of implements.

The chisel plough when first used to overcome these difficulties was found so successful that it is now used, in conjunction with a set of specially designed heavy harrows, for all seedbed preparation. Outstanding features have been its stability on steep slopes and its ruggedness and simplicity of construction, resulting in more timely cultivation and a significant decrease in repair bills. The extensive use to which it has been put and the skilled and enthusiastic manner in which it has been used have enabled a valuable appraisal to be made of its advantages, especially for soil and water conservation, when used on this type of country.

Features of Chisel Plough

The chisel plough can best be described as a multi-purpose cultivating implement designed in America for stubble mulch farming and the control of erosion, and resembling a conventional grubber or cultivator. The tines, which are made of specially selected and treated alloy steel to reduce breakages to a minimum, are spaced 12 in. apart, and the double-ended chisel points can plough to a depth of about 8 in. Topsoil is not turned under and only a limited quantity of subsoil is brought to the surface. Tines can be either fixed or fitted with stump-jump release attachments.

A number of different points and attachments are available for special

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Mr. Wise, Consulting Engineer to the Waitaki County Council writes: "We have no hesitation in saying that the Modernite Pipe used on the Enfield Scheme has given every satisfaction and was one of the major factors contributing to the low cost of this scheme."

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Mr. Boyes, General Manager of Transport Nelson and Highways Construction Ltd. had three miles of Modernite Pipe installed on the farm belonging to his company.

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work. Wide-angle heel sweeps and duckfoot points are used for cultivating and weedkilling, and overlap on the 12 in. rows ensures complete coverage of the area being worked. Ripper tines are also available for opening subsoil for increased penetration of moisture with little disturbance of topsoil.

On hill country the soil is not turned downhill as it is when the mouldboard plough is used. Also important is the fact that the chisel plough can be used on the contour on steep slopes, where conventional ploughs can be operated only in the direction of the slope.

Full advantage has been taken of this last-named feature on Mr Watherston's property. All operations are done on the contour with the assistance of automatic tractor-mounted levels. When the chisel plough is used in this manner a series of grooves on the contour is formed in the subsoil at the bottom of the worked ground, and these promote infiltration and absorption of water. This additional soil moisture is of considerable benefit to the subsequent crop.

Water Conservation

The effectiveness of this moisture conservation practice was thoroughly tested in the summer of 1955-56. Though only 11 in. of rain were recorded for the 12 months from April to March and severe drought conditions prevailed, excellent crops were obtained. Two and a half inches of rain were recorded in November that year, and it is assumed that enough of this was retained in the soil to ensure a satisfactory strike when sowing was carried out in February.

Cultivation

Cultivation of old grass paddocks is first begun in late autumn so that full advantage can be taken of the weathering action of frost to assist the breakdown of soil for seedbed preparation. About the previous November these paddocks are given a series of strokes with the chisel plough on the contour about a chain apart, so that rainfall received before cultivation is begun is held and stored in the soil and not permitted to run off. Though penetration in this initial stroke is not very great (maximum depth 2 to 3 in.) and depends on the hardness of the soil and density of the turf, this practice is thoroughly effective and ultimately increased soil moisture is available to benefit subsequent sowings.

Soil Conservation

The chisel plough system of working the soil is also valuable to prevent erosion, as the remains of vegetation are drawn to the surface instead of being buried. Here they act as protection against the destructive effect of individual raindrop splashes, reduce scouring, and act as a mulch to reduce evaporation. Protection is also afforded against wind erosion, to which protection the roughness of the surface after working also contributes.

THE CHISEL PLOUGH

A paddock near Kurow worked with the chisel plough.

This system of working also makes possible efficient penetration of air to the soil, a factor of considerable importance in seedbed preparation.

Pasture Furrowing

Owing to the low and unevenly distributed rainfall, pasture furrows have been found useful in this district for preventing run-off after rain and thereby increasing soil moisture available for plant growth. Significant reductions in flooding are also possible through the use of these furrows, which are usually made with a mouldboard plough after contour lines have been surveyed at predetermined vertical intervals.

Modifications made to the chisel plough to enable it to be used for this purpose have proved completely successful. Only one tine is used, fitted with mouldboard attachments for throwing the displaced turf clear of the furrow. These attachments are fitted on each side of the tine so that the implement can work both ways and the necessity for empty running of the tractor is avoided.

Penetration is possible to a depth of about 10 in., giving a channel with a good water-holding capacity, especially on steep slopes where it is difficult to make such a furrow with the mouldboard plough.

Contour cultivations made with the chisel plough are only about half the distance apart of those made with the mouldboard plough. The automatic tractor level used when putting the furrows in has proved entirely satisfactory.

Though these furrows are usually put in on the contour, in some cases a slight fall is allowed leading away from gullies or hollows where water concentrates. This takes the water away from these places on to drier faces where it is spread and distributed by furrows put in on the true contour.

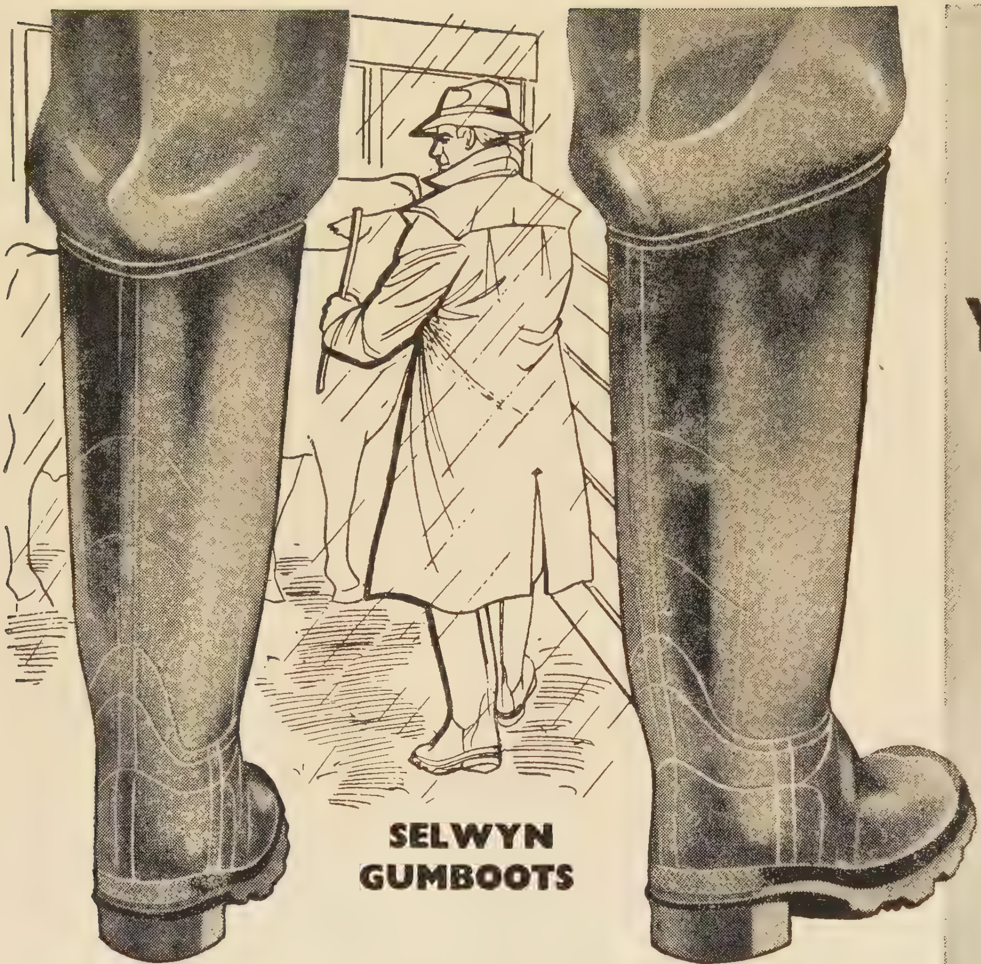
Cover Improved on Depleted Tussock Land

Considerable interest has been shown in recent years in the use of machinery on depleted tussock grassland with suitable topography for the introduction of pasture species for the improvement of vegetative cover and carrying capacity. A number of different implements have been tried, including the chisel plough fitted with seed and fertiliser boxes.

Sowing is done directly into the existing vegetation, the tines making a groove or furrow into which seed and fertiliser are led by tubes from the respective boxes. Both grasses and clovers have been established successfully in this manner, including perennial ryegrass, cocksfoot, and white, red, and subterranean clovers.

This work is extremely hard on implements. Bumping and jolting over tussocks and uneven ground impose a severe strain, and breakages can also be caused by concealed boulders. The rugged construction of the chisel plough enables it to stand up to arduous and testing conditions with a minimum of time lost through breakages. In particular the sturdy stump-jump releases fitted to the tines are of considerable value in country where boulders are numerous, such as the downland in the vicinity of Lake Pukaki.

The chisel seeder, being a trailing implement, is particularly adapted for use with a crawler tractor on comparatively steep slopes. On this type of country sowing can be done on the contour for water conservation, as the furrows left by the tines after seeding have a good capacity for water retention. The water so held considerably benefits seedling plants, especially in areas where low rainfall often limits successful establishment.



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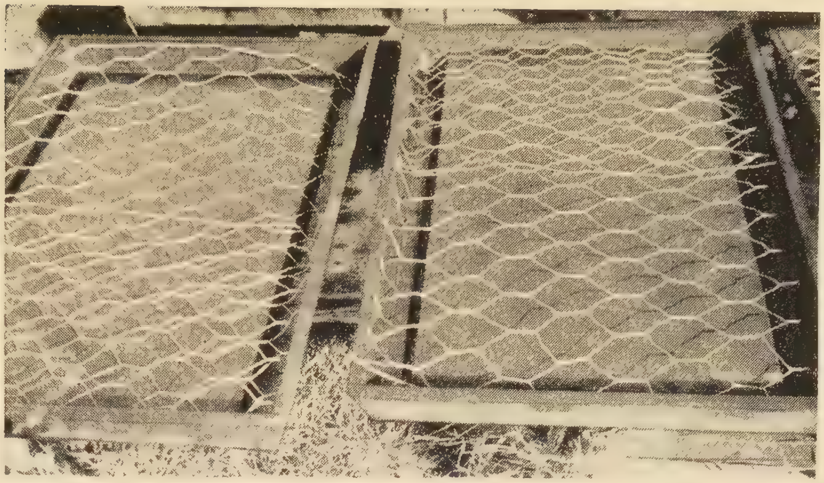
GUMBOOTS

Concrete Bottom Boards for Beehives

By I. W. FORSTER,
Apiary Instructor,
Department of Agriculture,
Oamaru

MAINTENANCE and replacement of wooden bottom boards involve beekeepers in considerable recurring expense, as they are inevitably exposed to dampness and attack by rodents, though modern preservatives have done much to reduce the effect of rot in timber. Concrete has been used from time to time, but few beekeepers have used it on a large scale. In this article the author describes a concrete bottom board which is giving such satisfaction that several beekeepers have adopted it as standard equipment.



Iron moulds with reinforcement in position.

THOUGH the bottom board is a simple uncomplicated piece of equipment, it occupies an important and difficult position and must measure up to certain definite requirements. It must be able to support the weight of the hive with a full honey crop, which may total several hundred pounds. As this weight is precariously tiered and often top-heavy, the bottom board must not tip or sag. Its collapse at a critical time can wreck a hive which, in falling, may in turn "skittle" a whole row of hives. Because the bottom board is so constructed as to provide the hive entrance, any distortion may interfere with the free passage of bees as well as affect the ventilation of the hive.

Particulars of the bottom board which is the subject of this article are as follows.

Of the same length and width as a standard wooden bottom board, the concrete bottom is about 1 in. thick. The convenience of being able to mould concrete easily to angles, curves, and graduations should be exploited to the full. The edges of the rim should be slightly rounded and the inner edge sloped to the floor at an obtuse angle, thus avoiding abrupt corners. The rim itself should be 1 in. high in the front, diminishing to ½ in. at the back. This gives the floor a slope down to the entrance to shed water and to facilitate the removal of debris by the bees, while the hive itself can stand dead level.

Moulds

A concrete bottom board must come from the mould even and true, as it cannot be trimmed or corrected later; therefore moulds must be of a solid construction that will not give or warp. Wood can be used, but the continual wetting and drying inseparable from the moulding of concrete tends to cause some distortion of wooden moulds. If moulds are made from wood, they are best line with flat iron to protect the wood from the effects of the wet concrete.

Newly filled moulds with coke breeze on the surface before final trowelling.

A hive on a concrete bottom board.

The most satisfactory moulds are of iron, which can be readily cast by a foundry if the beekeeper provides the required pattern. Though they are more expensive, iron moulds will turn out high-quality bottom boards for an indefinite period. The additional cost can be offset by several beekeepers bearing the expense, either on a share basis or by paying a hire fee to the owner.

Composition of Aggregate

To keep the weight to a minimum and to give greater warmth it is desirable that as much porous material as possible be used without unduly weakening the finished product. Though pumice may be suitable, coke breeze has been used with success and a satisfactory ratio to other ingredients arrived at by trial and error.

A suitable aggregate consists of 2 parts of coke breeze, 1 part of sand, and 1 part of cement.

A piece of ordinary fowl netting extending the width and length of the bottom board is usually sufficient reinforcement. Some beekeepers give additional strength by setting a piece of No. 8 wire down in the groove of the mould, running along the back and both sides. It is this groove, forming the raised rim of the bottom board that is most likely to be damaged. Though this extra reinforcement is obviously an advantage, actually many hundreds of concrete bottom boards with only wire netting for reinforcement have been in use for some years with no sign of deterioration.

Making the Boards

The concrete must be mixed wet enough to give a smooth surface against the mould. The coke breeze will tend to rise and roughen that surface which will eventually be the underside of the bottom board. This roughness has no apparent ill effect in practice, but if it is trowelled down a short time after the concrete has been poured, the breeze will stay down and a smooth surface will result.

Newspaper can be used to line the moulds and thus facilitate the removal of the finished bottom boards. Such lining needs to be carefully done, as any wrinkling of the paper gives a rough surface to the upper side of the bottom board. When paper lining is used the boards may be removed from the moulds in 24 hours; otherwise, 2 or 3 days must elapse before this can be done in safety. Concrete boards should be left for some months to dry thoroughly before use.

Cost

In all concrete work the availability of the material largely determines the cost. Under average circumstances cost of material per board would probably be:

	s.	d.
Wire netting for reinforcement		3
Cement (12 boards from a bag at 13s.)	1	1
Sand and coke breeze (98 boards from 1 yd. at £1) ..		2½
	1	6½

Some expense will be incurred for moulds, but this is not recurring.

Labour must be allowed for, but this would not equal that required to assemble wooden boards and apply preservative.

Disadvantages

A change from the conventional wood naturally engenders some criticism and certain often-quoted disadvantages in concrete bottom boards do need examination.

Inability of Concrete to Take Nails

Some beekeepers object to concrete bottom boards because they cannot be nailed or stapled to the bottom box when this is necessary for shifting hives or to keep stock from sliding the hive across the bottom board. This is certainly a drawback where it is necessary to nail into the bottom board. However, the use of bottom shifting screens provides a very satisfactory way of shifting hives and allowing the bottom boards to be carried separately.

If top screening is used, the lid is then available to stand the hive in. If conditions are such that no screening is required, the hives can be stood in spare lids, on a sack, or straight on to the flat deck of a truck. While in the apiary hives are not usually nailed even to wooden bottom boards, and they do not seem to slide any more readily on concrete.

Weight

Concrete bottom boards, because of their extra weight, do increase the work of transporting hives. This weight factor is one that cannot be completely overcome, but it has been reduced to a minimum in the bottom board described here by using the maximum proportion of coke breeze consistent with the required strength. This concrete board weighs 26 lb. compared with 6 lb. for the lightest counterpart in wood. However, space is usually a more important consideration than weight when apiaries are being moved, and in this respect concrete does not suffer in comparison with wood.

Warmth Factor

It is considered by some that as concrete is colder than wood, it could be injurious to bees, but concrete boards as described here have been in use for many years in conditions colder than average with no apparent ill effects. The use of a porous material like coke breeze makes a warmer board than if straight sand or gravel was used.

Advantages

Advantages of concrete bottom boards are:

1. Their great strength.
2. They are everlasting, with no maintenance costs.
3. They will not burn. Beekeepers using concrete bottom boards find that they have much more freedom to control grass growth by fire.
4. They will resist attack by rodents.
5. They have no crevices to harbour disease and can easily be sterilised by scorching.

Fruit Crop Estimates for 1958-59 Season

THE following estimates of the fruit crop for the 1958-59 season were revised in January. The pip and stone fruits are in 000's of bushel cases and the berry fruits are in tons. The estimates are summarised from information supplied by field officers of the Horticulture Division of the Department of Agriculture. Districts producing less than 500 bushels of a variety are not shown, but are included in totals. District totals of more than 500 are rounded to the nearest 1,000.

FRUIT	DISTRICT								
	Auckland Province except Gisborne	Gisborne	Hawke's Bay	Wellington and Taranaki Provinces	Nelson Province	Marlborough	Canterbury and North Otago	Central Otago	Total 000 bushels
APPLES—									
Ballarat	60	6	85	2	10	8	9	1	181
Cox's Orange Pippin ..	9	1	55	3	145	11	15	15	254
Delicious .. .	19	5	105	4	246	33	22	50	484
Dougherty	15	4	75	—	35	2	—	—	131
Granny Smith	140	6	150	8	114	4	3	5	430
Gravenstein	24	—	37	—	91	2	1	2	157
Jonathan	9	—	45	2	320	35	18	22	451
Sturmer Pippin ..	8	5	240	20	446	37	65	38	859
Others	103	6	194	7	218	21	56	40	645
Totals	387	33	986	46	1,625	153	189	173	3,592
PEARS—									
Beurre Bosc	7	—	3	—	10	—	—	—	20
Louise Bonne de Jersey	2	—	25	—	1	—	—	1	29
Packham's Triumph ..	15	—	13	—	12	—	—	—	40
P. Barry	13	1	17	1	6	—	2	—	40
W. B. Chretien ..	20	1	90	—	72	1	8	12	204
Winter Cole	3	1	80	2	67	2	8	7	170
Winter Nelis	1	1	55	—	15	1	2	14	89
Others	33	—	9	1	17	1	9	6	75
Totals	94	4	292	4	200	5	29	40	667
OTHER FRUITS—									
Peaches	101	17	420	1	49	8	9	87	692
Apricots	2	2	7	—	1	—	22	119	153
Nectarines	2	2	17	—	2	1	2	14	40
Plums	59	5	82	1	10	2	11	31	201
Cherries	—	—	1	—	—	3	2	11	17
Quinces	7	1	7	1	3	—	1	—	20
Totals	171	27	534	3	65	14	47	262	1,123
BERRY FRUITS—									
				Total in tons					
Boysenberries ..	6	3	20	10	10.5	—	2.5	.5	57
Currants, Black ..	—	—	.5	24	4.5	—	51	.5	80.5
Gooseberries	—	—	2	166	5.5	—	—	—	173.5
Loganberries	1	2	.5	12	—	—	8	—	23.5
Raspberries	3	2	32	125	178	2	375	36	753
Strawberries	580	3	12	50	6	.5	87	72.5	811
Totals	590	10	67	387	204.5	2.5	523.5	114	1,898.5

Chemically Preserved Fence Posts are Harmless to Stock

By D. L. HARRISON,
Scientific Officer, Department of Agriculture's Animal Research Station, Wallaceville

TRIALS to assess the danger to livestock of chemically treated fence posts, especially where arsenic is used in the treatment, have been carried out at the Department of Agriculture's Animal Research Station, Wallaceville, at the suggestion of and in cooperation with officers of the New Zealand Forest Service. Results showed that there was no risk to livestock where the fence posts were preserved with creosote, pentachlorophenol, Boliden S25, Tanalith U, and Tanalith C, which are commercially available in New Zealand. The only danger associated with the use of the preservatives was found to lie in animals having access to stacks of freshly treated timber or to the ground from which such stacks had been removed. Livestock should be rigidly excluded from these areas at all times.

WITH the serious depletion of New Zealand's indigenous trees and the need to conserve those remaining, a greater use is being made of chemically preserved softwoods. To extend their useful life against decay, fungi, and boring insects it is necessary to treat them with preservatives. There is, however, no chemical specifically poisonous to one species; chemicals which protect wood from insects and fungi are also poisonous to animals. The use of treated timber on farms therefore introduces a possible hazard the extent of which will depend on the nature of the preservative and its accessibility.

Most stock owners will have noticed how animals will lick and chew objects either out of sheer curiosity or because they contain something they like. Sheep on a Hawke's Bay farm chewed so persistently at fence posts that several were almost severed at the base. When the chewed posts were replaced the interference ceased, which strongly suggests that some ingredient in the original preservative was particularly attractive to the sheep.

Overseas Experience

Deaths of cattle that licked poles protected with arsenic compounds have been reported in Sweden and Switzerland. Access to creosote-treated poles and sleepers has been held responsible for stock losses in many places, though the evidence for creosote poisoning in some instances is not altogether conclusive. It is significant that most of these deaths occurred where freshly treated wood was left lying on the ground before use. The surface run-off of excess preservative, as well as the area of wood accessible for licking, would be at a maximum in these cases.

Hyperkeratosis (X-disease) caused heavy losses among stock in the United States of America and Germany until the cause was eventually traced to chloronaphthalenes in some brands of wood preservatives and lubricating oils.

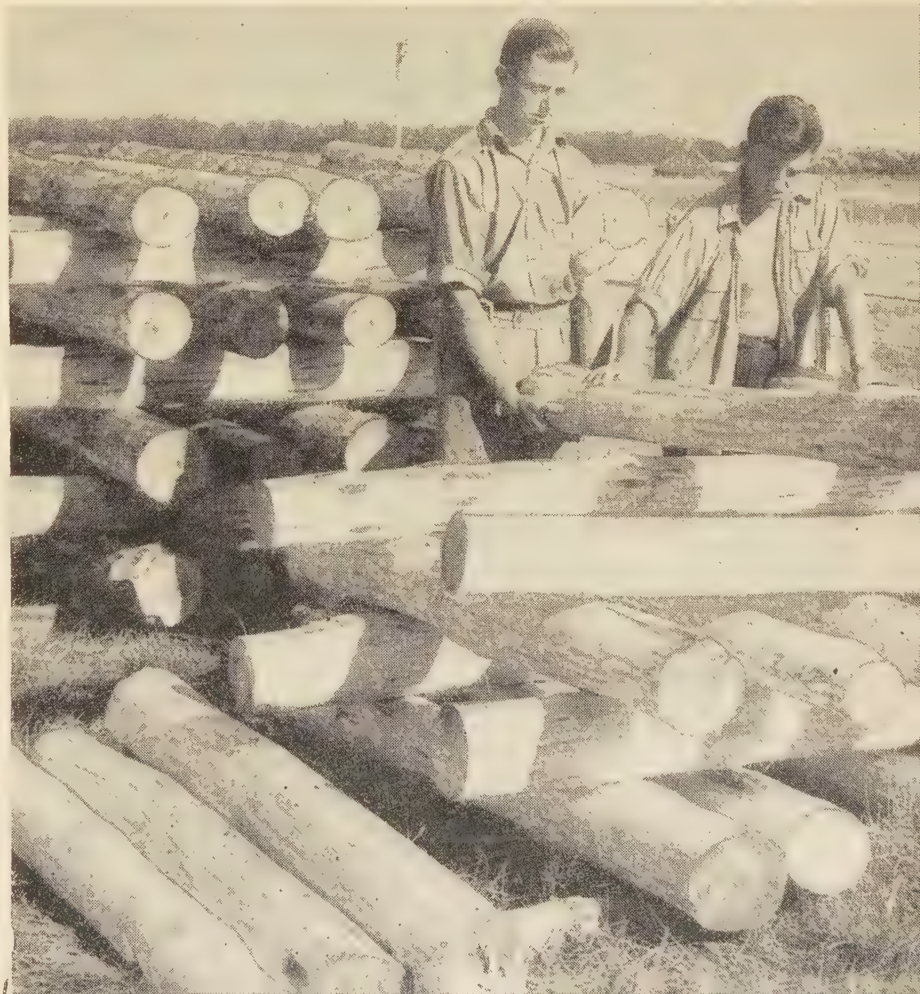
It was desirable therefore that the use of chemically treated fence posts, especially where arsenic was used, should be evaluated under New Zealand conditions before such materials could be confidently recommended as safe for farm use. A summary of the toxicity trials which were carried out at the Wallaceville Animal Research Station is given here.

Preservatives Tested

The preservatives tested were:

1. Creosote: A distillation of coal tar, containing varying quantities of tar acids. The creosote used in the trials

▼ Livestock should be kept off areas where freshly treated timber has been stacked or ground from which a stack of treated posts has been removed.



was the grade specified in the N.Z. Standard Specification 401 as used by the New Zealand Forest Service.

2. **Pentachlorophenol:** Essentially chlorinated carbolic acid and used as a 5 per cent solution in petroleum oil.

3. **Boliden S25:** Copper-zinc-chrome-arsenate.

4. **Tanalith U:** Fluor-chrome-arsenate with dinitrophenol.

5. **Tanalith C:** Copper-chrome-arsenate.

Both creosote and pentachlorophenol are absorbed into wood relatively unchanged in chemical composition.

The last three are multi-salt "fixed"-type preservatives with arsenic as the principal toxic ingredient. These are formulated as water solutions which penetrate wood and, during the time allowed for "fixation", form compounds that are highly resistant to leaching.

Though the treating solutions which contain soluble arsenates are unquestionably very poisonous to animals, the fixed compounds, being largely insoluble, should be much less harmful.

In practice, the weight of preservative absorbed divided by the total volume of both heartwood and sapwood is termed the loading. As the heartwood is not impregnated, the sapwood will contain a higher concentration of preservative than the overall loading would indicate. In these tests the sapwood only was used. Creosote and pentachlorophenol were used at strengths of three times and Boliden S25 at twice the loadings recommended for fence posts. The Tanalith-treated sapwoods were supplied at normal commercial loadings.

The wood for the arsenic preservatives was reduced by milling to a fine powder. With water, this gave a free-flowing suspension suitable for drenching by stomach tube. Creosote and pentachlorophenol were added to ground wood just before dosing. Hoggets and heifer calves of the body weights shown in the table were used as test animals.

Toxicity Defined

Acute toxicity is defined in these tests as the amount of treated wood in a single dose causing death, and **chronic toxicity** as the amount of treated wood, given in regular daily doses, causing death from chronic effects in about a month.

TABLE 1—TOXICITY OF PRESERVATIVES ON SHEEP AND CALVES

Preservative	Acute toxicity	Chronic toxicity
Sheep (66 lb. body weight)		
Pentachlorophenol ..	5.7 oz.	2.5 oz.
Creosote	10.6 oz.	1.3 oz.
Boliden S25	16.0 oz.	2 to 4 oz.
Calves (220 lb. body weight)		
Pentachlorophenol ..	1.0 lb.	6.0 oz.
Creosote	3.0 lb.	4.4 oz.
Boliden S25	3.1 lb.	2 to 4 oz.

Hoggets were clinically unaffected by single 1 lb. doses of Tanalith U- or Tanalith C-treated wood, or by 1, 2, or 4 oz. doses for 25 consecutive days. Post-mortem examination of sheep on the highest chronic dose rate (4 oz. daily = 6¼ lb. of wood during the trial) revealed no abnormalities whatever.

From these data it is clear that the wood treated with pentachlorophenol had the highest acute toxicity (single dose) in both hoggets and calves but the lowest chronic effect (repeated doses). It was rapidly absorbed and excreted so that cumulative effects were slight. In fact, the equivalent of several acute fatal doses was tolerated over a period with no permanent injury resulting.

Creosote and Boliden S25 were less acutely toxic than pentachlorophenol but showed more marked cumulative effects, and relatively low proportions only of the acute fatal quantity were tolerated daily. The sheep that received the Tanalith-treated woods showed neither clinical nor post-mortem changes from normal at the levels drenched.

Assessment of the Hazard

The chances that some toxicity will occur in practice can now be assessed, using the known toxicological data derived from the trials.

The least quantities of wood necessary to cause acute poisoning, 5.7 oz. for sheep and 1.0 lb. for calves (Table 1), are far in excess of what individual animals could obtain at any one time. The amount of wood which ruminants could reasonably be expected to get from a fence post is small. Having front teeth only in the lower jaw, their attack is merely a scraping action aided by licking.

Also, chewed timber would not be so finely divided as the ground wood used in the tests so the leaching of the preservatives would be less complete. Posts with a relatively thin sapwood ring could possibly approach our highest test loadings in the outer surface layers, but in general the loadings would be considerably lower than these. The chances of acute poisoning occurring in practice are therefore considered to be negligible with any of the five preservatives.

With the preservative which showed the highest chronic toxicity (in table) the lowest daily intake of preserved wood leading to chronic poisoning is 1.3 oz. for hoggets and 2.0 oz. for calves. **These are the least amounts which must be eaten every day for a month.** To illustrate these quantities in a more practical way, consider the 3 ft. above ground of a 4½ in. diameter softwood post. This would weigh about 12 lb. One hundred sheep chewing wood at 1.3 oz. per sheep per day for 30 days would consume in this time the equivalent of 20 complete fence posts; an extremely unlikely event. With the added consideration pointed out before, it is clear that the chronic hazard is also negligible.

As to the arsenic preservatives the trials indicate that even if concentrations of up to four times the usual loadings were attained in sapwood in practice, the chances of stock poisoning would still be extremely unlikely. Commercial timber treatment in New Zealand is governed by a standard code of practice which ensures continued uniformity of composition of the chemicals used and in the methods of treatment. This is particularly important with regard to coal tar creosote which can vary greatly in composition from different sources. The toxicity data for creosote, given above, will not be applicable to other grades which do not conform to the required specification.

The only danger associated with preservatives lies in animals having access to stacks of freshly treated timber or to the ground from which such stacks have been removed. Livestock should be rigidly excluded from these areas. Of the preservatives tested only creosote and pentachlorophenol would be involved in re-treatment of posts already in use on farms. Where this is carried out the welfare of stock must be the first consideration and particular care should be taken to prevent excessive splashing and surface run-off on to adjacent pasture. It is recommended that animals be moved well away from the site of operations until the chemicals have been fully absorbed into the wood.

Conclusions

There is no risk to livestock involved in the use of fence posts preserved with creosote, pentachlorophenol, Boliden S25, Tanalith U, and Tanalith C which are commercially available in New Zealand. Injury to animals can arise only through their access to the treating solutions. It is the responsibility of those using preservatives to ensure that this does not occur.

Acknowledgment

The Tanalith U- and Tanalith C-treated wood was supplied by Hickson's Timber Impregnation Co. (N.Z.) Ltd., Auckland, and this cooperation is acknowledged.

FESTIVE FARE AT EASTER

By ELEANOR S. CAMPBELL,
formerly Home Science Instructor,
Department of Agriculture,
Auckland

At Easter many people expect certain traditional foods to be served on certain days, and the custom of serving pancakes on Shrove Tuesday and hot cross buns on Good Friday has been followed for centuries. For Easter Sunday thoughts turn to eggs—chocolate eggs, coloured eggs, and decorated eggs. However, cakes, too, can lend a smart appearance to the Easter table, and this article gives recipes for Easter cakes as well as recipes for pancakes and hot cross buns.

The recipes for pancakes have different flavourings and fillings so that the pancakes can be served at the appropriate time and still provide variety.

Pancakes

Though the ingredients and methods of mixing pancakes may vary in the following recipes, the method of cooking remains the same for all.

Most batters improve if left standing in a cool place for about ½ to 1 hour before cooking. As the mixture for the pancakes should be of the consistency of thin cream, it is easier to handle if poured from a jug to the frying pan.

Basic Pancake Recipe

4 oz. of flour
¼ teaspoon of salt
Fat for frying
1 egg
½ pint of milk
Sugar and lemon to flavour

(4 servings)

Sieve the flour and salt into a bowl. Make a well in the centre and into this drop the egg. Beat this mixture, carefully drawing in the flour from the sides of the bowl, and at the same time gradually add about half the milk. Beat until smooth. Beat with a wooden spoon until the batter is well aerated, about 5 to 10 minutes. Now add the remainder of the milk and mix until the batter has the consistency of thin cream. Put aside in a cool place.

Pancakes are not hard to make and variety is provided with different flavours and fillings.

Melt sufficient fat (butter or lard) to cover the bottom of a small frying pan and heat until it is smoking hot. Pour in enough batter mixture to form a **thin** coating over the bottom of the pan. Cook slowly, until the underside is a golden brown, turning up the edges carefully with a spatula to see this. When the underside is cooked, turn the pancake over carefully with a slice or spatula and cook the other side.

When the pancake is cooked squeeze some lemon juice and sprinkle sugar over it, roll up quickly, and serve piping hot, with sugar and slices of lemon.

These pancakes can also be served with savoury fillings, spread quickly on them while hot in place of the lemon and sugar, and then rolled.

Savoury Fillings

Grated cheese
Chopped ham and parsley
Salmon (creamed with a thick white sauce)
Chopped asparagus
Chopped cooked mushrooms

Except for the grated cheese, have the fillings hot before spreading them.

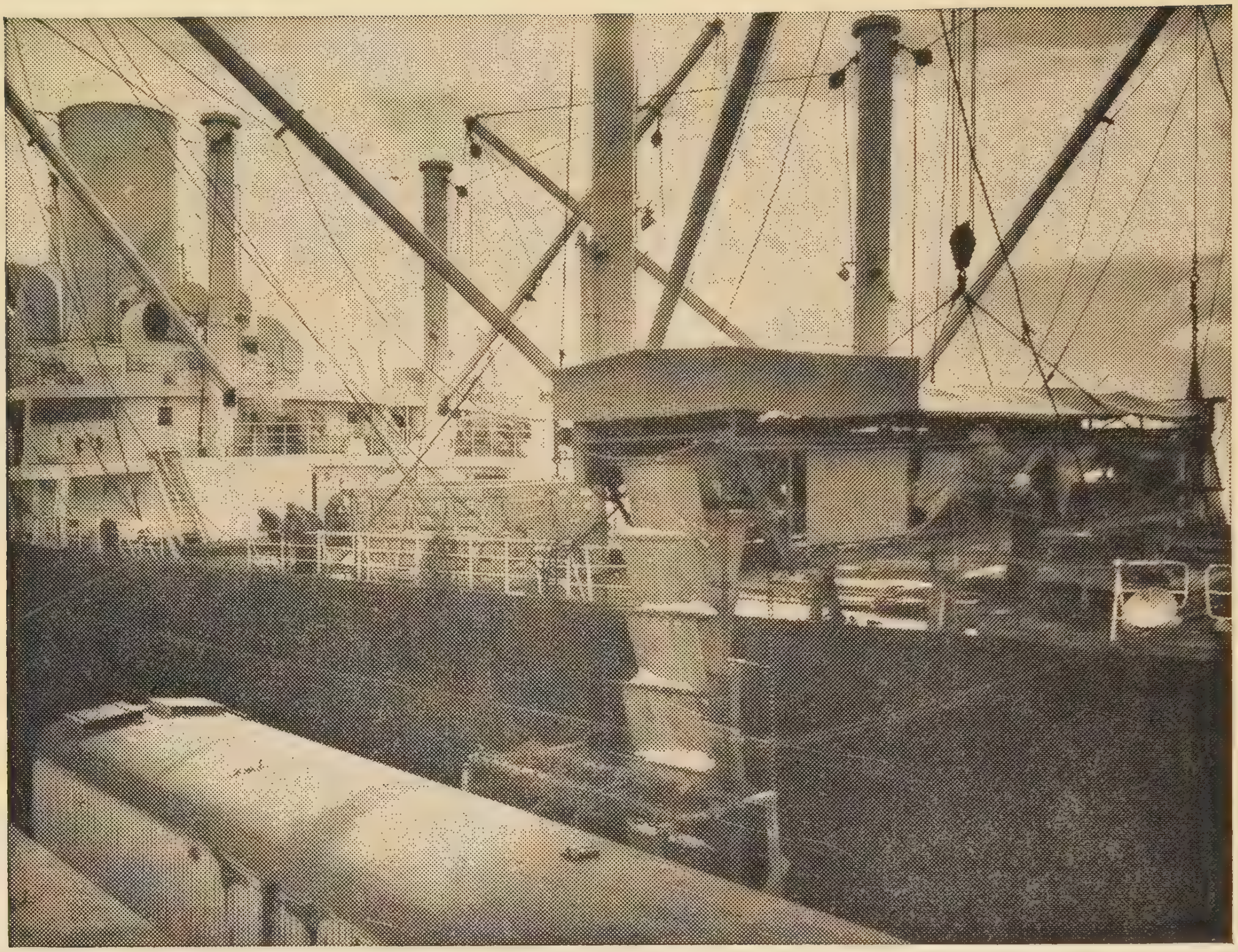
Plain Pancakes

4 oz. of flour
1 egg
Pinch of salt
Fat for frying
½ pint of milk or milk and water
Flavouring (lemon essence if desired)
1 lemon
Sugar

(4 servings)

Separate the yolk and white of the egg and beat separately. Sieve the flour and salt into a basin, add the beaten yolk and white of the egg, and beat until a smooth batter results. Gradually stir in the liquid until the batter has the consistency of thin cream. Set aside in a cool place for about an hour. Cook according to the method given for the first recipe.

When the pancake is cooked squeeze lemon juice over it, sprinkle on some sugar, roll up quickly, and serve piping hot with lemon slices.



You never know till you try

The quicker a ship can take her cargo aboard and put to sea, the better for everyone. But loading a ship calls for expert planning and personal skill on the part of the men who carry it out. Loading, therefore, can never be wholly mechanised; but could not machines be used to speed up this vital work?

Well, you never know till you try – and the experiment was felt to be worth making.

And so you will see, at Bluff, the Donald Conveyor. This equipment is designed to load meat on an endless belt system. From experience gained with it a revolutionary new Meat Loading Berth has been designed as part of the Port of Southland's major development scheme. Carcasses will be unloaded under cover from insulated railway trucks and conveyed by five Donald Type Conveyors to the ships' refrigerated compartments. Loading will proceed at a faster-than-normal speed and interruption through adverse weather will be eliminated.

At Auckland, another mechanical aid is at work in the shape of the Butter Conveyor, by which another of New Zealand's great export products is delivered direct from Cold Store to an upper floor of the Wharf Shed by conveyor and then lifted by crane directly into the ship's Hold.

Now, nobody – and certainly not the Lines (who have encouraged their use) – would regard these installations as a complete solution. But they have shown that mechanisation *can* do *something* to reduce the time required to load a ship.

And that is important. Since anything which reduces *time* also reduces *cost*, these mechanical loading devices indicate one more way in which something is being done to offset the otherwise inexorable rise in operating costs.

The Donald Conveyor and the Butter Conveyor are therefore matters of direct concern to every user of New Zealand's shipping service...which probably includes *you*.

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Sweet Pancakes

4 oz. of flour
2 eggs
Pinch of salt
Fat for frying
1 dessertspoon of sugar
½ pint of milk
Jam or preserve

(4 servings)

Sift the salt and flour into a basin and stir in enough milk to make a thin paste. Separate the yolks and whites of the egg; beat the yolks thoroughly and mix into the batter. Add the sugar and the remainder of the milk and mix to a smooth, thin paste. Whisk the egg whites to a stiff froth and stir gently into the batter. Leave aside in a cool place. Cook as for the previous recipes.

Heat a little jam (strawberry, blackcurrant, or gooseberry gives good flavouring), and spread this on the pancake as soon as it is cooked. Roll up and serve.

If preferred, a thin jam sauce as described may be used to pour over the pancake, either in addition to or instead of the jam filling.

Jam Sauce

4 tablespoons of jam
¼ pint of water
½ lemon
1 level teaspoon of cornflour

Put the jam and water into a saucepan and bring to the boil. Mix the cornflour with a little cold water, add to the boiling jam, and stir until the mixture is slightly thick. Allow to boil 1 to 2 minutes. When cooked add strained juice of half a lemon. Serve hot with pancakes.

Orange Pancakes

4 oz. of flour
¼ teaspoon of salt
1 egg
Fat for frying
½ pint of milk
1 tablespoon of castor sugar
Finely grated rind of 1 orange
Orange flavouring

(4 servings)

Sieve the flour and salt into a bowl. Add the beaten egg and beat the mixture until smooth, gradually adding about half the milk. Aerate thoroughly by beating with a wooden spoon for 5 to 10 minutes. Add the remainder of the milk, the sugar, and the finely grated orange rind. Mix well and leave in a cool place. Add flavouring as desired.

Orange Sauce

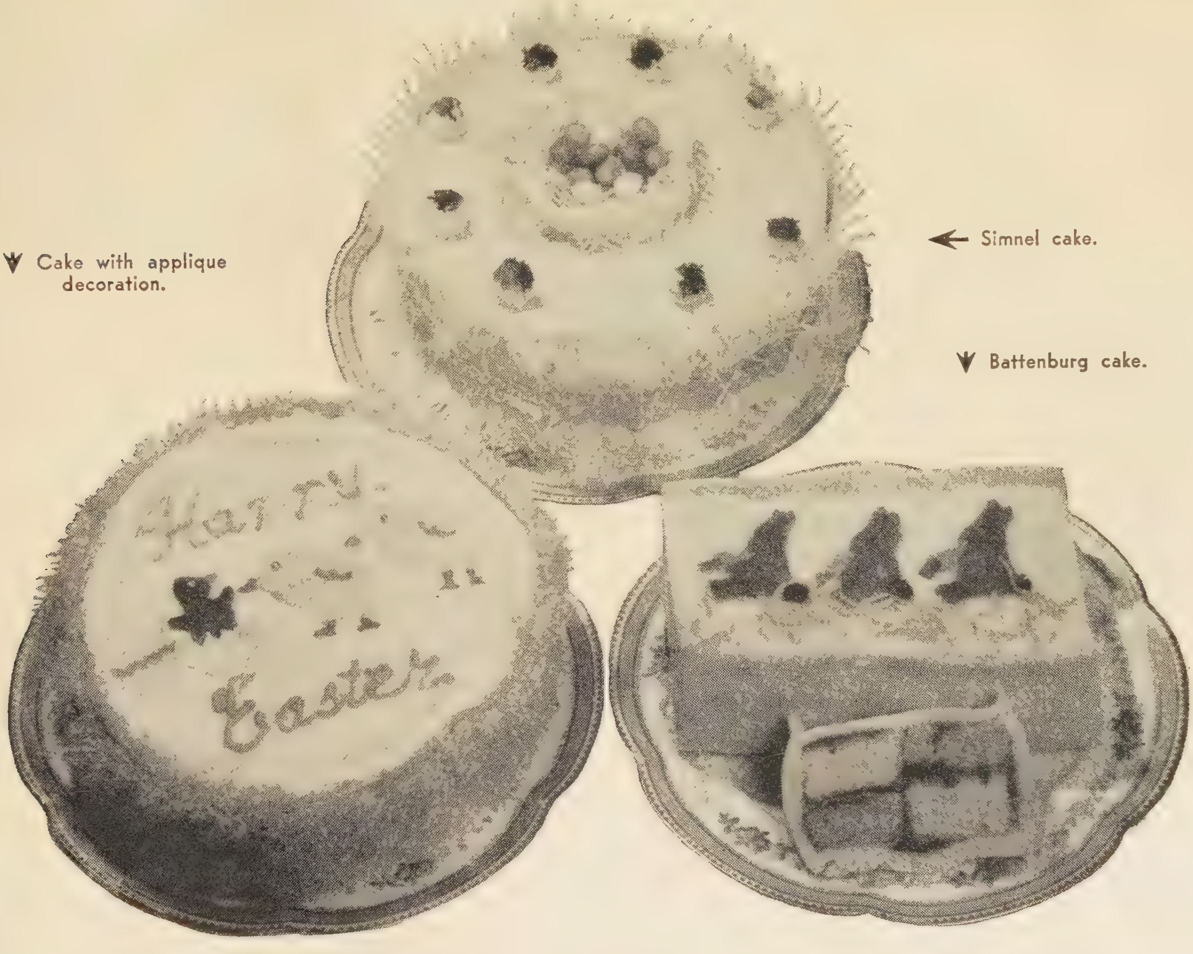
1 orange
½ lemon
¼ pint of water
Sugar to taste
2 teaspoons of cornflour

Squeeze the orange and lemon and strain the juice. Put the water and sugar into a saucepan and bring to the boil. Mix the cornflour with a little cold water, stir into the boiling water, and keep stirring until thickened. Boil 1 minute. Take off heat and add the fruit juice.

Cook the pancakes as described for the previous recipes. Roll up when hot and serve with the orange sauce.

Spiced Pancakes

4 oz. of flour
¼ teaspoon of ground cinnamon
¼ teaspoon of mixed spice
Pinch of salt
Fat for frying
1 oz. of butter
2 eggs
½ pint of milk
2 teaspoons of sugar



← Simnel cake.

▼ Cake with applique decoration.

▼ Battenburg cake.

Three ways of decorating Easter cakes.

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Easter biscuits.

Easter baskets.

Filling

2 tablespoons of brown sugar

1 teaspoon of cinnamon

(4 servings)

Sieve the flour and salt into a bowl. Mix carefully with the milk to form a thin paste. Add the spices and sugar. Beat the eggs thoroughly and stir them into the batter. Melt the butter and add. Beat well and leave in a cool place.

Prepare the filling by mixing the cinnamon and brown sugar together.

Cook the pancakes as in the other recipes, spread with the brown sugar and cinnamon mixture, roll up, and serve with slices of lemon.

Hot Cross Buns

Hot cross buns are traditionally served on Good Friday morning.

Hot Cross Buns

1½ lb. of flour
1¼ oz. of yeast (1 cake)
4 oz. of castor sugar
¾ pint of tepid milk
½ teaspoon of salt
2 eggs
1 teaspoon of ground cinnamon
1 teaspoon of ground nutmeg
4 oz. of currants
2 oz. of chopped candied peel
4 oz. of butter
Milk and sugar to glaze

(Makes 3 dozen)

Sift half a pound of flour into a basin. Cream the yeast with a teaspoon of sugar and stir in the tepid milk. Stir this into the sieved flour, mix well, and leave in a warm place for 20 minutes. Cover the basin with a cloth. Sift the remainder of the flour with the salt, cinnamon, and nutmeg and stir in the sugar, currants (cleaned), and peel. Melt the butter and beat the eggs.

When the mixture has risen stir in the dry ingredients, add the melted butter and beaten eggs, and mix thoroughly. Turn on to a lightly floured board and knead by hand until the dough is smooth and elastic. Shape into a ball and put in a greased basin. Cover with a cloth and leave in a warm place to rise until it has doubled its size (about 1½ to 2 hours).

Turn on to a floured board and knead lightly again. Cut into small pieces which can be shaped into round buns. Place these on a greased tray, allowing room for the buns to spread. Cut a deep cross on top of each with a knife and leave in a warm place for a further 20 minutes. Bake in a hot oven (400 degrees F.), for 20 minutes or until a golden brown.

If not used immediately, the buns should be heated through in the oven just before being served.

English Hot Cross Buns

1½ lb. of flour
2 teaspoons of salt
2 oz. of sugar
3 oz. of butter
1¼ oz. of yeast (1 packet)
½ pint of tepid milk
2 eggs
2 oz. of cleaned raisins
2 oz. of cleaned currants
2 oz. of mixed, chopped peel
½ teaspoon of salt

(Makes 3 dozen)

Crumble the yeast into 2 teaspoons of the sugar, cream until dissolved, add the tepid milk. Add the rest of the sugar and leave until thoroughly dissolved. Then add the 2 eggs (slightly beaten). Leave the mixture in a bowl. Sift into this half the quantity of flour and the salt and beat with a wooden spoon until it is all mixed in and smooth. Melt the butter and beat into the mixture. Gradually add the remaining flour (sifted) and work well in. Turn on to a lightly floured board and knead until the dough is smooth and elastic, for about 5 minutes. Shape into a ball and place in a greased basin. Cover the bowl with a damp cloth and leave in a warm place until the ball has doubled its size.

Turn on to a floured board again, add the fruit, and knead lightly. Cut or shape into round buns. Place the buns on a greased tray, well apart. Make a deep cross in the top of each bun with a knife. Bake in a hot oven (400 degrees F.) for about 20 minutes or until the buns are golden brown.

If preferred, crosses may be piped with glace icing on top of the buns when cooked.

Cakes

The traditional cake to serve at Easter time is the Simnel cake, a simple recipe for which is given.

Simnel Cake

8 oz. of flour
4 oz. of butter
4 oz. of sugar
2 eggs
½ teaspoon of salt
2 teaspoons of baking powder
1 lemon
3 oz. of currants
3 oz. of raisins
3 oz. of candied peel
½ teaspoon of ground ginger
½ teaspoon of mixed spice
½ teaspoon of ground cinnamon
½ lb. of almond paste

Line a 6 in.-diameter cake tin with greaseproof paper. Sift the flour, salt, and baking powder together. Cream the butter and sugar until light and fluffy. Add the grated rind of 1 lemon to this and 1 tablespoon of strained lemon juice. Add the spices and beat well into the mixture. Next add the well beaten eggs. Now fold the sifted flour mixture into the creamed butter, sugar, and egg mixture. Add the cleaned and floured fruit to the mixture and mix well in. Add enough milk to give a dropping consistency.

Cut off about one-third of the almond paste, roll out, and cut a round to fit the size of the cake.

Put half the cake mixture into the tin, place the round of almond paste on top, and then put in the second half of the mixture.

Bake in a moderate oven (375 degrees F.) for 2½ to 3 hours. When the cake is cold the top may be decorated with the remainder of the almond icing.

Another decorative cake which is simple to make is the Battenburg cake.

Battenburg Cake

6 oz. of flour
6 oz. of butter
6 oz. of sugar
3 eggs
Raspberry jam
1 teaspoon of baking powder
Pinch of salt
Essence of vanilla
Cochineal
½ lb. of almond paste

Line with greaseproof paper two flat rectangular sponge tins, about 7 in. by 5 in. See that the paper comes at least 2 in. up the sides of the tins.

Cream the butter and sugar until light and fluffy. Beat the eggs. Sift the flour, baking powder, and salt together. Stir into the creamed butter and sugar the flour mixture and beaten eggs alternately. Add a few drops of vanilla essence.

Put half the mixture into one tin, spreading it evenly over the tin. Add cochineal to the other half of the mixture and mix well in until the mixture is a deep pink. Put this mixture into the other tin. Spread flat with a spatula, leaving a slight depression in the centres of the mixtures in both tins, as a flat surface is wanted in the cooked cake.

Bake in a moderately hot oven (400 degrees F.) for about ½ hour or until the cake is firm and pale brown on top. When cooked turn on to a cake rack to cool.

When the cakes are cold trim the edges neatly and cut each piece longitudinally down the centre. This leaves two white and two red pieces of sponge.

Warm some jam in a saucepan and brush over all sides of the pieces of sponge with this. Then place one white and one red strip next to each other, and on top of these place the other two strips, the white on the red and the red piece on top of the white. Press together; the jam should help the pieces to adhere. It is easiest to work on a large piece of greaseproof paper to do this.

On a board sprinkled with a little castor sugar roll the almond paste out into a flat piece, about 7 in. wide. Make it long enough to fit completely round the cake, leaving only the ends open. Lift the cake on to the strip of almond paste and bring the paste up around the cake, pinching the ends together. Press the paste well on to the cake. Mark the top with a knife or fork as desired. Wrap the whole cake firmly in greaseproof paper and leave to stand overnight before serving.

Extra decorations can be added when the paper is removed from the cake.

Applique Decoration for a Cake

Though generally associated with sewing, applique decoration can be used to advantage in cakes also.

After a design has been chosen divide some almond paste into the required number of pieces, according to the number of colours needed. Add the colouring and mould well into the paste.

For the decoration on the front-left cake shown on page 297 the outlines of small chickens were traced on to a piece of greaseproof paper and then the shapes were cut out. The paste was divided into three pieces. One piece had no added colouring and one piece was coloured a light yellow and one a chocolate colour. The pieces were then rolled out thinly, the cut-outs of the chickens were placed on the yellow piece, the small chick on the chocolate-coloured piece, and the broken egg on the white piece. A very sharp knife was used to cut around the edges of the paper through the paste. The paper was then removed and the cut-out almond paste shapes were lifted out.

The cut-out pieces should be left ready on a piece of greaseproof paper.

The cake should be covered with a smooth layer of white icing. Royal icing was used for the cake illustrated. The shapes cut out from the almond paste were placed in position after the icing on the cake was dry and were stuck on by a small piece of royal icing. Each piece was fitted into position. With icing forcers extra decoration was added where necessary. Silver cachous formed the eyes of the chickens and the legs and beaks were added with the icing forcers.

Small Cakes for the Tea Table

Easter Biscuits

8 oz. of flour
4 oz. of butter
1 egg
4 oz. of sugar
Pinch of salt
1 teaspoon of baking powder
2 teaspoons of ground cinnamon
1 oz. of chopped candied peel
2 oz. of washed currants

(Makes about 20 biscuits)

Sift the flour, baking powder, and salt together. Rub the butter into this, add the sugar and cinnamon, then the beaten egg, and mix to a firm dough.

Roll out thinly on to a floured board, cut into rounds, bake in a moderate oven (350 degrees F.) for about 10 minutes or until pale brown. Cool on a wire tray.

Easter Baskets

These Easter baskets make attractive decorations and are quite simply made by using small sponge cupcakes as the base.

Other ingredients needed are whipped cream or butter icing (about ½ cup of either will decorate 6 cupcakes), a little disiccated coconut, about 1 oz. of coloured sweets which resemble small eggs, and angelica.

Cut the top off the small cakes and scoop out a small hollow in the centre. With an icing forcer pipe rough edgings of cream or butter icing around the baskets. Sprinkle coconut in the centres and around the edges to give a rough impression and place the sweets in the centres. Cut strips of angelica and place over the tops, like handles of baskets (see left illustration on page 299).

All photographs by Sparrow.

ROCK GARDENS

▲ A natural outcrop of rocks can be made into a garden asset.

HOME gardeners confronted with making a garden on sloping ground often consider the development of a rock garden. However, such a garden can also be made on a flat section and will then be particularly attractive by creating a change in the general layout. Selection of a suitable site and the fundamentals of construction and establishment together with the general cultivation and maintenance required are dealt with in this article.

By K. H. MARCUSSEN,
Horticulturist,
Department of Agriculture,
Christchurch

ROCK gardens and alpine gardening fascinate many people, probably because most of the plants used are small and each one has its own charm. Furthermore, rock gardens can be made to suit any size of garden, varying from a few yards square to the large and boldly laid out ones in park-like gardens. In the past rock gardens were sometimes made of heaps of rocks with the rocks placed too close together; plants were then frequently struggling for existence in the small spaces available for them. Fewer rocks are used nowadays and results are more pleasing with the plants growing under more congenial conditions.

True alpines will not grow satisfactorily in some of the warmer districts, particularly where humidity is high, but many dwarf plants which will give a pleasing display can be substituted.

Site

The best site for a rock garden is a slight slope facing north, in the open, and with good drainage. Most rock garden plants, particularly alpines prefer full sun; hence the preference for a northern slope. Some grow better in partial shade, but this can be provided readily on a slight slope, where such plants can be set on the southern side of large rocks which will give the shade they need. This cannot be done so easily on a steep slope, where the height of the rockery may not be sufficient to create shade in a natural manner.

A rock garden should be in the open mainly because the plants require full sun. Large trees in the vicinity will throw shade at some time, except if they are on the southern side. Even there they should be far enough away that no branches overhang, not only because of shading, but because water would drip from them during wet weather. Rain usually is beneficial, but drips from overhanging branches can be very damaging, as the drops often fall continually on the same spot.

Roots from trees growing close by can also cause trouble by depriving the rock garden plants of both moisture and plant food. Even certain types of hedge plants and shrubs can be detrimental and should be used in the vicinity with discrimination.

Most rock plants, particularly alpines, need perfect drainage. Where

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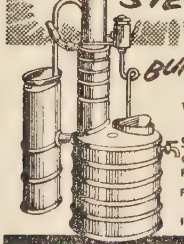
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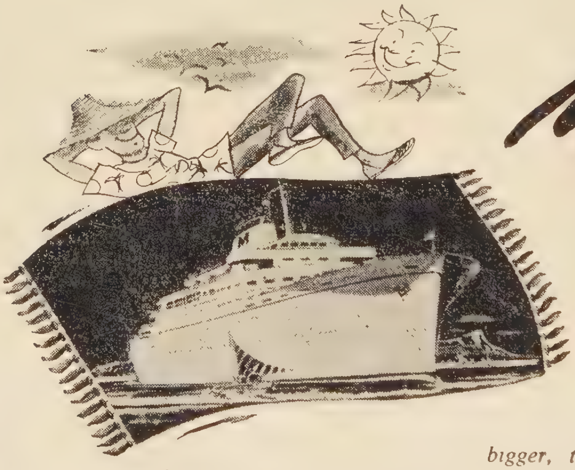
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they are growing naturally they may at some time of the year be subjected to much moisture round the roots, for example, when snow is melting, but the nature of the soil in which they are growing will facilitate immediate run-off. Without good drainage most alpines will soon succumb.

Lawn approaches are very suitable and the addition of one or more pools, according to the size, will greatly enhance a rock garden, particularly when a running stream, possibly with small waterfalls, is incorporated in the layout.

Pools provide a restful → atmosphere to a rock garden.

[Welsh

Rocks

A rock garden is sometimes developed round a rocky outcrop and there is then no question of selection of site. More commonly, however, the rocks are brought to the site. Such rocks should be selected, not just ordered from a quarry, and though cartage cost usually necessitates the use of stone which is available in the district, some discrimination as to type should be made.

The rock preferably should be weathered and if it is possible to obtain stone with lichen growing on it, so much the better; the rock garden will then have an established appearance as soon as it is made.

Hard rock should be avoided, as it seldom blends into the surroundings. Broken porous stone is not suitable either, as it tends to crumble, particularly in districts which experience hard frosts. If this stone has to be used, the hardest surface should be placed uppermost to overcome deterioration.

A rough type of stone is most suitable, as it provides good growing conditions for the plants and if it is fairly soft, it will weather quickly and any marks made during construction of the rock garden will soon disappear. Limestone and volcanic rock are the best types available. Limestone, however, should be well weathered before use, as otherwise it may make the soil too alkaline.

The rocks should be large, though in proportion with the size of the rock garden and the whole flower garden area. It is very difficult to make a worthwhile job with very small stones.

Construction and Layout

The first step in making a rock garden should be to plan the layout in as much detail as possible. This cannot be done in the same manner as for other garden arrangements, but it is essential to have clear thoughts on what is to be done.

The various sections of the rock garden should be readily accessible, especially if it is large, as otherwise maintenance tends to be neglected. Paths should therefore be pegged out at an early stage, though their final position may be rearranged as the work progresses.

The main features should be decided on and the work begun on these; the surrounds can be built up afterward to suit the particular characteristics.

Rocks must be close together on steep slopes to prevent the soil being washed away, but the rocks should be grouped together on gentle slopes in a manner in which nature might have left them. On a rocky hillside you can find some rocks close together, then perhaps odd ones here and there, and again other groups of them, their occurrence being very irregular. This should be the aim in the layout of a

[Welsh

A recently built and partly → planted rock garden showing a good type of rock. The rocks are not closely packed, but have been placed in natural positions providing good growing conditions for the plants.

rock garden instead of having the rock scattered indiscriminately throughout the area.

Where different types of rocks must be used the various groups should consist of different-sized rocks and these should be matched as much as possible within the group. For instance, in natural conditions a piece of granite would not be found among limestone.

On a sloping section the layout is fairly simple, as generally the contours will be followed; in some instances, such as on steep slopes, the grade may be the deciding factor in the arrangement. On flat sections, however, the rock garden should be placed so that it becomes part of the whole garden and blends into the surrounds. The height should therefore always be in relation to the size of the base.

The rocks should be placed firmly. Large rocks should be sunk well into the ground so that they will not move later. They may have to be wedged into position on steep slopes; in fact, a construction in the nature of a dry stone wall is sometimes required. It should be kept in mind that children always find delight in climbing over rocks, and hidden dangers to them should be guarded against.

Soil

After construction of a rock garden, particularly on a hillside, the available soil is often found to be poor and sometimes very heavy. It already has been stressed that good drainage is essential for rock garden plants and any improvements required must be made before planting.

Improvement to the soil will have to be done according to the type of plants which are to be grown in any particular position. For true alpines it is generally desirable to open the soil up with coarse sand and chips, thereby making the soil comparable to that of their natural habitat. For the coarser types of rock plants, those which are often grown in the mixed border, it will be more beneficial to incorporate decayed organic matter such as compost; this will improve the water-holding capacity of the soil and make additional nutrients available.

Care should be taken to ensure that the soil is well packed round the rocks and that there are no air pockets.

The addition of lime to the soil must be governed by the kind of plants it is intended to grow.

Selection of Plants

The selection of plants will depend largely on the size of the rock garden. Subjects which are fairly compact and do not spread much should be chosen for small areas, but bigger and more vigorous types of plants can be used for larger ones, where dwarf trees and shrubs also may be used. Small subjects give a better display when several of the same kind are grouped together; this should be allowed for when space permits.

Alpine plants flower mainly in summer, but other types of plants can be used to provide colour throughout the year. There are many small bulbous plants which are colourful during late winter and spring. Some even flower in autumn. Herbaceous plants can also be used to extend the season and many are now available in dwarf forms; small evergreen shrubs and dwarf coloured conifers are always attractive.

▼ Rock garden plants are delightful when flowering.

[*Elliott*

The list on this page gives a range of plants which are useful for rock gardens and the positions for which they are suitable.

Planting

The main planting of rock garden subjects should be done in autumn or spring. In many North Island districts it can also be done during most of the winter, but winter planting is not advisable where hard frosts are experienced. Some specialist growers supply rock garden plants in pots and such plants can be planted out of season, but special attention should be given until they are established. Bulbs should be planted at the appropriate times for the individual kinds.

The soil should be moist, but not too wet. The roots should be spread out well and soil packed among them. Plants which have been growing in pots should have the roots slightly teased out at the bottom, and any consolidated soil round the top of the plants should be broken to allow better entry of water. Any which appear to be pot bound should have the roots gently eased out round the whole ball to encourage them to grow into the new soil. Usually the crown should be planted at soil level; any exceptions from this can be noted on the plants when they arrive. Too deep planting is generally harmful.

Plants set out in spring may need watering. Any extra attention given at planting time will prove well worth while later.

General Attention

During the first year or two the main attention to a rock garden will be to ensure that plants are establishing and are in a suitable situation. That may not always be so and it is sometimes wise to lift unthrifty plants and shift them into other positions, where they will get more or perhaps less sun, or into a different soil mixture. Such shifts, however, should be made at an appropriate time and generally not in the middle of summer.

Weeds must be removed as they appear. Some rock plants are very small and can easily be smothered, so weeding should be done frequently. It will be beneficial at the same time to stir up the soil between the plants with a small fork or cultivator.

Watering should be done as required; once established, rock garden plants, in common with other garden plants, should be given a periodic soaking in preference to frequent light hosing.

Most of the plants will require further attention when the rock garden has been established for a few years. Vigorous kinds that tend to spread should be kept within bounds. Some may become rather bare in the centre with vigour showing only in the new growth on the outside of the clumps. Cutting back may rectify these defects or it may be better to replant. Sometimes shoots will have layered and can

PLANTS SUITABLE FOR ROCK GARDENS

Plants for Sunny Places

Achillea species
Aethionema species
*Allium species
Androsace species
Antennaria dioica
Arabis albida
Arenaria species
Armeria maritima
Armeria alpina
Aster species and varieties
Aubrietia deltoidea and varieties
†Berberis darwini nana
*Bulbocodium vernum
Campanula species
Celmisia species
†Ceratostigma plumbaginoides
†Ceratostigma willmottianum
†Cistus species
*Colchicum species
*Crocus species
†Cytisus procumbens
†Cytisus purpureus
Dianthus species and varieties
Dicentra species
*Galanthus byzantinus
*Galanthus elwesi
†Genista species
Gentiana acaulis
Gentiana corymbifera
Gentiana pneumonanthe
Gentiana saxosa
Gentiana sino-ornata and other species
Geum species
Gypsophila species
†Hebe species
Helianthemum chamaecistus (vulgare) varieties
Helichrysum species
*Hyacinthus azureus
Hypericum species
Iris innominata
*Iris reticulata
Iris unguicularis (stylosa) and other species
Lithospermum species
Mazus radicans
†Magnolia stellata
Mesembryanthemum species
Morisia hypogaea
*Muscari azureum
*Narcissus species
Nepeta species
Nierembergia species
Papaver alpinum
Phyteuma species
†Rhododendrons of the R. calostratum series
†Rosa dwarf species
†Rosmarinus prostratum
Saponaria species
Saxifraga species and varieties
*Scilla sibirica
Sedum species
Sempervivum arachnoideum and other species
Silene species
Statice species
*Sternbergia lutea
Teucrium species
Thymus species
*Tulipa species
Veronica species
Wahlenbergia saxicola
Zauschneria cana

Plants for Shady Places

*Anemone species
Aquilegia species
Auricula species
*Chionodoxa luciliae
Cotula species
Cotyledon species
*Crocus species
*Cyclamen neapolitanum
Cypripedium species
Daphne blagayana
Daphne cneorum
†Deutzia gracilis
Epimedium alpinum
†Erica species
*Eranthis hyemalis
*Fritillaria species
†Gaultheria hispida
*Hemerocallis species
*Leucojum autumnale
Meconopsis betonicifolia var. baileyi
Mimulus species
†Mitraria coccinea
Nertera depressa
*Ornithogalum umbellatum
Ourisia species
Primula littoniana and other species
Ranunculus species
Thalictrum alpinum
Trillium grandiflorum
Viola species

Acid-intolerant Species

Achillea species
Aethionema species
Alyssum montanum
Alyssum saxatile
*Anemone alpina
*Anemone pulsatilla
Aquilegia species
†Cistus species
*Cyclamen species
Gentiana species
Gypsophila species
Lithospermum gastoni
Papaver alpinum
Papaver nudicaule
Phlox subulata
Primula (most alpine species)
Sedum species
Sempervivum species
*Sternbergia lutea
*Tulipa species
Wahlenbergia saxicola

Lime-intolerant Species

†Andromeda species
*Anemone sulphurea
*Anemone nemorosa
†Daboecia cantabrica
†Daphne alpina
Daphne cneorum
†Erica species (except E. carnea)
†Gaultheria hispida
Gentiana sino-ornata
†Kalmia latifolia
Lithospermum prostratum
Meconopsis betonicifolia var. baileyi
†Pernettya mucronata
†Pieris species
Primula (some species)
†Rhododendron (most species and varieties including azalea)

Creeping or Trailing Species

Achillea species
Alyssum montanum
Alyssum saxatile
Androsace species
Antennaria dioica
Antirrhinum asarina
Antirrhinum glutinosum
Arabis albida and other species
Aubrietia deltoidea varieties
Borago laxiflora
Calandrinia umbellata
Campanula species
†Cotoneaster adpressa
†Cotoneaster congesta
†Cotoneaster horizontalis
†Cytisus kewensis
Gaultheria nummularioides
Gaultheria procumbens
Linaria cymbalaria
Lithospermum prostratum
Mimulus radicans
Nertera species
Polygonum affine
†Rosa pendulina and var. pyrenaica
†Rosmarinus prostratum
Sedum species
Thymus species

Dwarf Trees and Shrubs

Abelia floribunda
Abies picea nana
Andromeda species
Betula nana
Cassinia fulvida
Chamaecyparis lawsoniana minima glauca
Chamaecyparis obtusa nana
Daboecia species
Erica species
Juniperus communis (dwarf varieties)
Kalmia latifolia
Magnolia stellata
Picea glauca conica
Picea orientalis nana
Pernettya mucronata
Rhododendron species and varieties including azalea
Spiraea bullata
Thuya occidentalis ericoides
Thuya orientalis sieboldi
Zenobia pulverulenta

Bulbs and Other Species with Underground or Ground-level Perennating Organs

Allium species
Anemone species
Chionodoxa luciliae and other species
Colchicum autumnale
Crocus species
Cyclamen coum
Cyclamen europaeum
Cyclamen neapolitanum
Fritillaria species
Galanthus species
Hyacinthus azureus
Iris species
Leucojum vernum
Muscari azureum
Narcissus bulbocodium
Narcissus cyclamineus
Narcissus minimus
Narcissus triandrus
Scilla bifolia and varieties
Scilla sibirica
Scilla verna
Tulipa clusiana
Tulipa fosteriana
Tulipa montana
Tulipa sylvestris and other species

* Bulbous plant or one with a ground-level or underground perennating organ.
† Dwarf tree or shrub.

be used for replacements, or cuttings can be made, the latter being the method usually employed by nurserymen. Others again seed freely and the resulting seedlings make the clumps too crowded and some thinning out may be required. The aim should be to keep the plants growing well but not so vigorously that they become crowded.

Some topdressing with good friable soil mixed with compost or sand is necessary from time to time, especially where soil has been washed away and roots are exposed.

Fungous diseases seldom cause much trouble in rock garden plants, though various insect and soil pests often do.

Greenfly (aphids), thrips, and mites may build up if not controlled, but these can be dealt with readily with malathion. For a bad infestation, two or three applications should be made at fortnightly intervals.

Malathion, DDT, or lindane can be used against various caterpillars.

Woodlice (slaters) sometimes become numerous; they are best checked by generous use of 2 per cent DDT dust in the places where they congregate.

Snails and slugs are probably the greatest problem and many of the best dwarf plants may suffer severely if they are not kept under control. The nature of the plants grown and the shelter afforded by the rocks provide slugs and snails with ideal conditions. Metaldehyde in a ready-mixed bait should be placed near their haunts, or a liquid form of metaldehyde can be sprayed on to the plants and the ground.

Garden Work for April

With the colder weather and the beginning of frosts in some districts many plants take on an autumn appearance as leaves colour and begin to fall. During cleaning up it will be necessary to burn any diseased material, but healthy plant material should be composted.

Formal Beds

Tuberous begonias should be lifted from their beds and placed in wooden trays in a dry, frost-free place to dry off gradually. The tops should not be cut off but should be allowed to die down naturally. For colder districts the same treatment can be given to fibrous-rooted begonias and geraniums. In warmer areas these will store satisfactorily under a hedge or similar shelter.

By ROSALIE A. CAMPION,
Horticultural Instructor,
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[Elliott

Plants of the blue *Cynoglossum amabile* can now be planted out.

Calendulas, French marigolds, and other annuals should be removed and the beds prepared for replanting. Iceland poppy plants, which are now available in good pastel shades as well as brilliant scarlet and orange, should be planted early this month.

Polyanthus, of which there are many fine strains, can be planted out. Old plants selected for their quality can be broken into sections and replanted. In frost-free areas cinerarias will give a good display if planted 15 in. apart in good soil. The crowns of these plants should be above soil level when planted out to discourage fungous rot. *Primula malacoides*, calendula, pansies, violas, beauty stocks, *Bellis perennis*, wallflowers, and sweet william are some of the most reliable plants for a spring display. Sweet william is now available in a variety of colours in a dwarf size for edging as well as the 15 to 18 in. high type.

For the Mixed Border

Six weeks after blooming, gladiolus plants can be lifted with the cormels attached and dried off in boxes placed out of direct sunshine. When dahlias have been cut by the frosts the tops should be cut off 6 in. above ground level. They should not be broken off, as the buds for next year's growth may be damaged. These buds lie at the junction between root and stem. Where frosts are not heavy dahlias can be left in the ground over winter, but where frosts are severe they should be lifted and dusted with DDT before storage. Any diseased or distorted plants should be burnt.

Annuals, biennials, and other plants which are past their usefulness should be removed. Areas of the border can be replanted as space becomes available. The planting of clumps of bulbs in the spaces should be hastened. The soil can first be improved by the addition of compost. Bulbs, including iris, ornithogalum, ixia, and tulips, can be planted. In the north tulips should be kept in a cool place until conditions become cool enough for planting. Snowflakes (which have several flowers on a stem) and snowdrops (only one flower per stem) can be planted. The foliage of *Iris unguicularis* (*I. stylosa*) should now be cut back to within 4 to 6 in. of the ground. This, with a dusting of DDT, will discourage slaters and slugs, which can damage the flowers.

Border Plants

Plants such as Canterbury bells, gaillardias, perennial scabious, aquilegia, delphinium, and lupins can now be planted out in groups in the border. The different colour markings, ease of growth, and number of quality blooms borne on stout stems make gaillardias excellent border plants. *Cynoglossum amabile*, which produces large sprays of forget-me-not like flowers during spring, can be planted now among shrubs in a well drained position where it often naturalises quite freely.

Hardy annuals, including clarkia, cornflower, nigella, calendula, godetia, and larkspur, can be sown in warm borders to become established before winter and give flowers in early spring. Seedlings of annuals sown where they are to flower should be thinned as soon as possible, as if overcrowded they will develop into spindly plants which will give a quick but short flush of spring flowers.

Carnations can be planted out and large clumps of pinks can be lifted and divided. Rooted layers of border carnations can be planted out in an open, sunny border.

Rockeries and Banks

Bulbs are well suited for planting in pockets of soil on rocky banks or slopes and, with succulent plants, can make such areas very colourful. *Fritillaria imperialis*, the Crown Imperial, does best under cool soil conditions and the fleshy bulbs should be replanted as soon as possible. If the bulbs are damaged, sulphur or thiram should be dusted on the wounded surface before planting.

Chionodoxa (glory-of-the-snow) galanthus (snowdrop), crocus, tritonias, and freesias are showy plants for such situations. Galanthus and chionodoxa should be labelled so that the bulbs of these plants, which multiply slowly, are not lost.

Plants of *Sedum spectabile* Brilliant can be planted in the heavier rockery soils, where it flowers for a long period during summer. In the warmer districts *Billbergia nutans*, with its stately pink stem up to 18 in. long and green flowers in spring, can now be planted out. The closely related *Beschonaria yuccoides*, which has a spectacular red stem up to 8 ft. high, can be planted in barren, rocky positions in full sun.

Plants from Cuttings

Many shrubs and trees can be propagated by hardwood cuttings taken at this time. Results are often disappointing when the cuttings are not taken until later when the deciduous plants lose their leaves. Cuttings taken now should form a callus area, from which roots later develop, at the base of the cutting before the ground becomes too cold. Cuttings of evergreen material, including conifers and hedge plants, should be 6 to 10 in. long and the leaves should be removed from that portion of the stem which will be below ground. Cuttings of roses, forsythia, flowering currant, jasmine, or honeysuckle should be 10 in. long. If suckering or basal growth is undesirable, as with rose stocks, the bottom buds should be removed before cuttings are inserted firmly up to half their depth in sandy soil.

Cuttings of perennials such as Jerusalem sage (*Phlomis*), perennial wallflowers, marguerites, calceolaria, verbena, and pentstemon can be placed in a cold frame ready to root during winter and will be ready for spring planting.

Plants for Shady Positions

On the south side of the house, where little sun penetrates, quite a good range of material can be planted. Two old-fashioned plants which are regaining favour are Solomon's seal, with its graceful stem of white bells beneath, and bleeding heart, with its quaint pink and white flowers. These two can be left undisturbed for several years. *Thalictrum dipterocarpum*, astilbe, and aquilegias are all very useful for picking. Newer varieties of aquilegias combine many lovely colours. Two bulbs which could be planted now in this position are *Fritillaria meleagris* (snake's head) and dodecatheon. Both need a gritty soil to which generous amounts of compost have been added. The crowns of convallaria (lily of the valley) and bulbs of erythronium (dogstooth violets) can be planted under similar conditions.

Cinerarias will grow quite well with little sun and should be planted early this month in frost-free positions.

Trees and Shrubs

Orders for trees, shrubs, and hedge plants should be placed as soon as possible and preparations for planting begun. In deep, rich loams little preparation will be necessary, but in gardens on poor soils or being developed on rotten rock or stony soils preparation for planting will be necessary for most plants. Some of the South African plants, such as proteas and leucospermums, do not appreciate the incorporation of organic matter, but otherwise holes can be dug out to a depth of 2 ft., the subsoil forked, and compost plus a dressing of bonedust mixed with the soil before it is replaced.

Plants which are to be transplanted later should be wrenched. This entails the cutting of the roots, the depth depending on the size of the plant. With large specimen trees half the tree may be wrenched one year and the other half early in the year of transplanting.

Cleaning up and Lawns

Dead leaves should be raked up and placed in the compost bin; a large quantity could be stacked separately. The leafmould so formed is useful as a mulch or in potting mixtures. If leaves are left lying on lawns, the grass becomes yellow and rotting may occur in the lawn owing to poor aeration. Any twitchy lawn growth or moss can be raked at the same time. The twitch growths should then be mown against the direction of the raking. If lawn areas have become lifeless through heavy summer compaction, they could be aerated by pushing in a fork to full depth and levering back the handle to lift the soil slightly before withdrawing the fork.

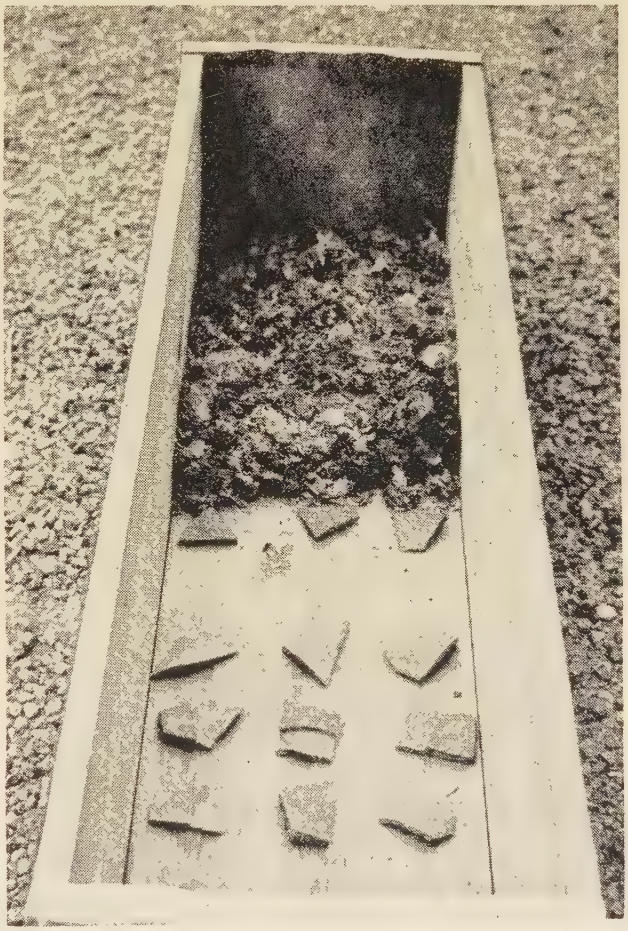
As plants fade the stakes supporting them should be removed and washed under the tap to remove the soil before they are stored. Dipping the ends in creosote or other preservative will prolong the life of stakes.

Replenishing Window Boxes

Of the annuals mentioned for bedding, calendulas are probably the most reliable for window boxes. If the boxes are small, the soil may need replacing each time the box is replanted. The size of the box will usually be a compromise between the desirability (mostly for labour reasons), of having a large area of soil and the elegant appearance of the box. It is undesirable to have too much bare board showing and a depth of 9 in. is usually satisfactory.

Glasshouse Work

Begonias will be passing their best display and water should be gradually withheld as they dry off. When the



Preparation of a window box for planting. The concave pieces of pot (crocks) each cover a ½ in. drainage hole. A layer of spent hops has been placed over the crocks to give further drainage and prevent the soil mixture from clogging the holes.

[Elliott

The Jerusalem sage (*Phlomis fruticosa*) can be increased by taking cuttings in April.

tops have shrivelled the tubers can be knocked out of their pots and most of the soil removed from the roots. The tubers should be dusted thoroughly with flowers of sulphur before being placed on a tray of dry sand for storing.

Bulbs for flowering in bowls can still be potted up and placed in a cool position for 6 weeks while the roots develop. Bowls which were prepared earlier may be ready to bring into a cool room. They should be watered sparingly at first.

After a dry, dusty summer most foliage plants require to have the leaves cleaned with a sponge. For shiny leaved plants the addition of summer oil to the water freshens the foliage and will clean up any scale insects or mealy bugs present.

Fuchsia plants can be allowed to dry out gradually to rest the plants. Geraniums and balsams can be pruned back hard to encourage new shoots.

Seed of many glasshouse flowering plants, such as schizanthus and calceolaria, should be sown.

General

In mild districts hydrangeas can now be pruned and sweet peas sown. The ties on budded roses should be examined and cut as the buds begin to swell.

Gladiolus corms with rotten patches or scars should be discarded. Any valuable corms with slight areas of infection can be treated individually, however, by cutting out infected areas and dusting liberally with sulphur. They should be stored and subsequently planted separately from sound bulbs. All bulbs should be dusted with DDT and flowers of sulphur before being stored in a dry, cool, airy, and frost-free place.

Chrysanthemums will give larger blooms if disbudded early. A soluble foliar fertiliser given now will be beneficial. Late-flowering varieties need to be covered if they are to flower outside in frosty districts.

Book Review

"Designed Flower Arrangement": Margaret O'Brien

THE author of this well printed and attractively designed publication is obviously a painstaking enthusiast who is determined that her readers shall have a thorough appreciation of all the factors necessary for successful flower arrangement.

In eight chapters, seven of which originally appeared in "The New Zealand Journal of Agriculture", she has given much useful information, which might best be indicated by the chapter headings: Flowers as an Art Medium; Possibilities of Containers; Informal Line Designs; Formal and Mass-line Designs; Table and Wall Designs; Colour in Plant Material; Dried Flowers for Winter Use; and Amateur Flower Arrangement Shows.

Though line design is a very important factor in successful flower arrangement, to the real enthusiast and the average woman alike probably the most interesting aspect is the colour factor, and perhaps the most engrossing contribution of this book is its detailed explanation of colour complexities and the drawings of a colour chart and colour wheel, both in full colour. Masks for the colour wheel and detailed instructions on use of the wheel are included.

As the book is printed on very good paper with many excellent illustrations, it seems a pity that one or two of the more spectacular arrangements illustrated were not reproduced as full-colour, full-page pictures.

The book can be recommended not only to the confirmed enthusiast but also to the average woman who likes flowers throughout her home, but has not the knowledge that would enable her to achieve much better effects.

A. H. and A. W. Reed, Wellington, New Zealand, 1958. 15s.

Efficient Equipment Makes Ironing Easy

By MARY HUNT,
formerly Home Science Instructor,
Department of Agriculture, Christchurch

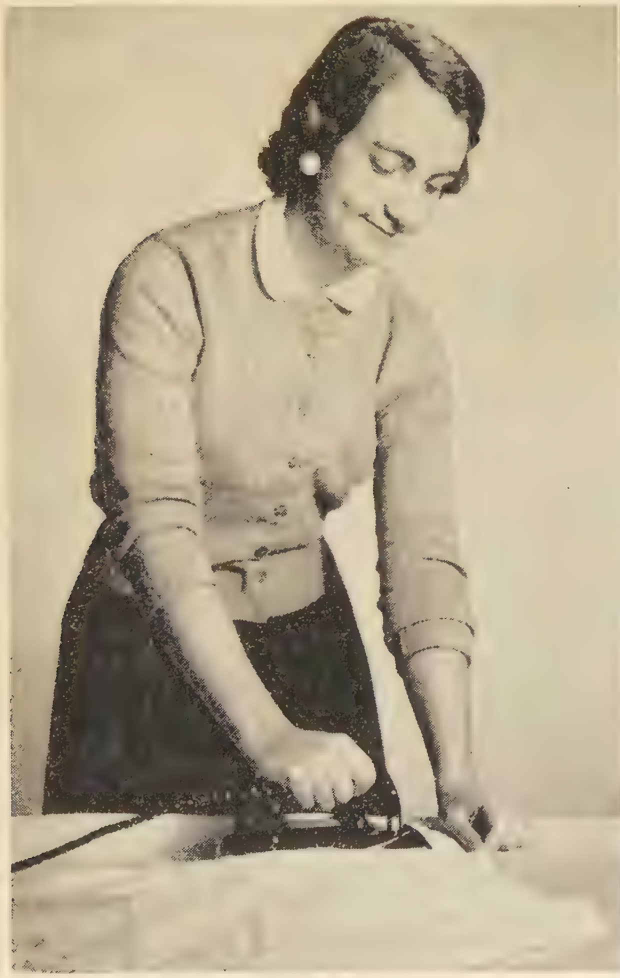
THE extra cost of efficient ironing equipment is justified in that it simplifies ironing and reduces fatigue to a minimum. It is now possible to obtain lightweight, up-to-date irons and many types of ironing boards, either built-in ones or portable ones with folding legs to facilitate ease of storage. However, many housewives continue to iron on kitchen tables, which may be satisfactory for flat articles, but which are not as suitable for ironing frocks and shirts, which can be ironed much more simply on a shaped ironing board.

A FACTOR which is important to the ease with which ironing is done is posture, and this can be affected in many different ways.

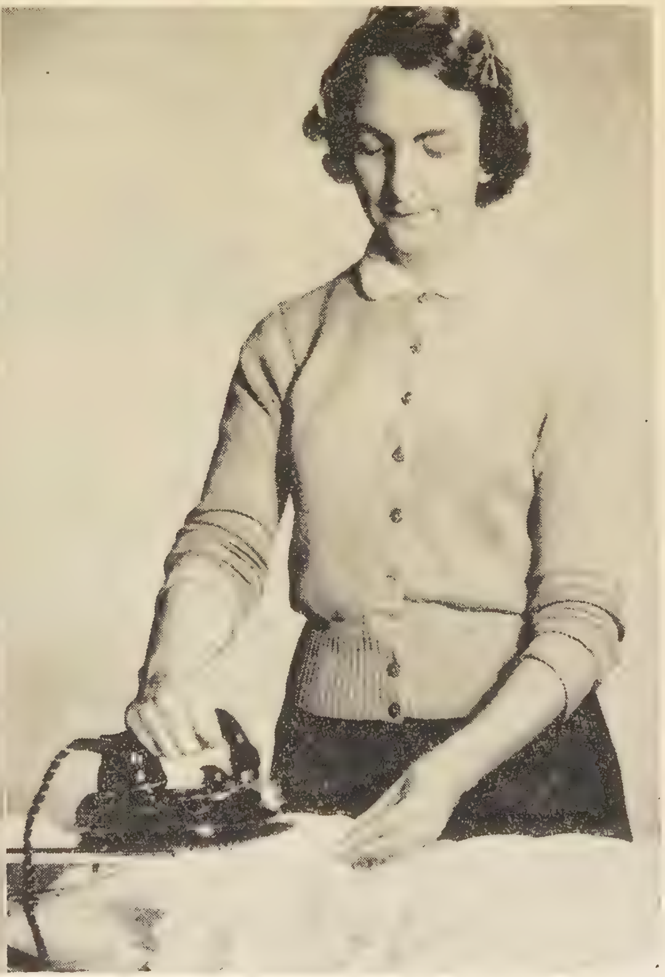
Height of Ironing Surface

If done at the correct height, ironing is much less a drudgery. Most kitchen tables are far too low, which means that the ironing position must be such that the back is continually bent and most of the strain is placed on the muscles of the spine, which are some of the weakest in the body.

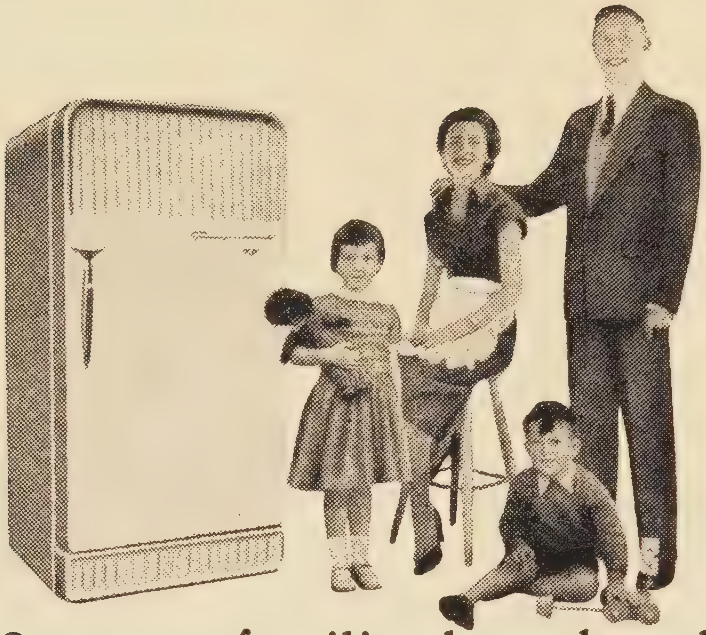
If an ironing board of the correct height is used, the housewife should be able to stand straight and iron with her arm slightly bent. A good ironing height for the average woman is 32 to 35 in., but the housewife herself can best judge her most comfortable working height. The ideal type of board is that which is adjustable to several different heights, from a sitting height



Ironing at a low table may cause an aching back. Intricate garments are difficult to iron on a flat surface.



Ironing on an ironing board at a comfortable height. The board makes the ironing of intricate garments easier and the sleeve board is useful for sleeves and gathers.



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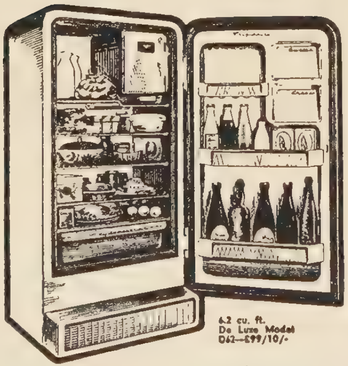

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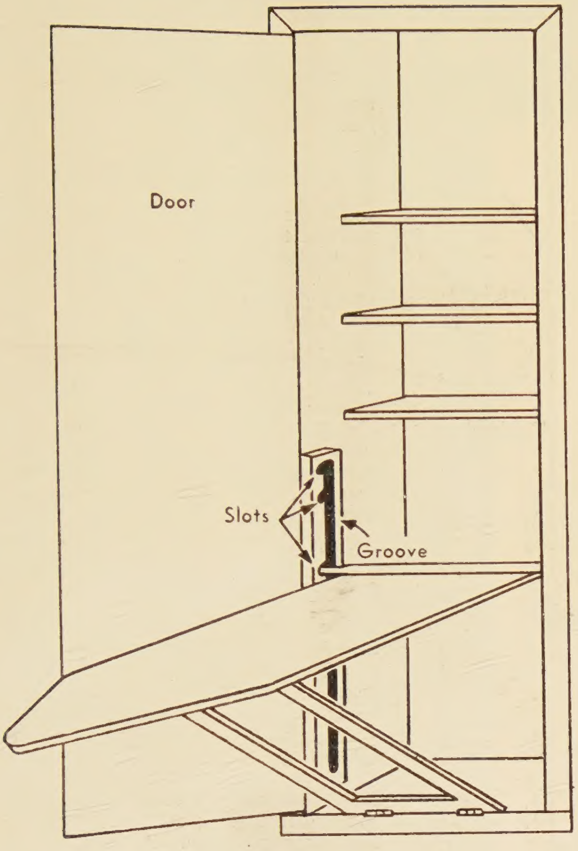
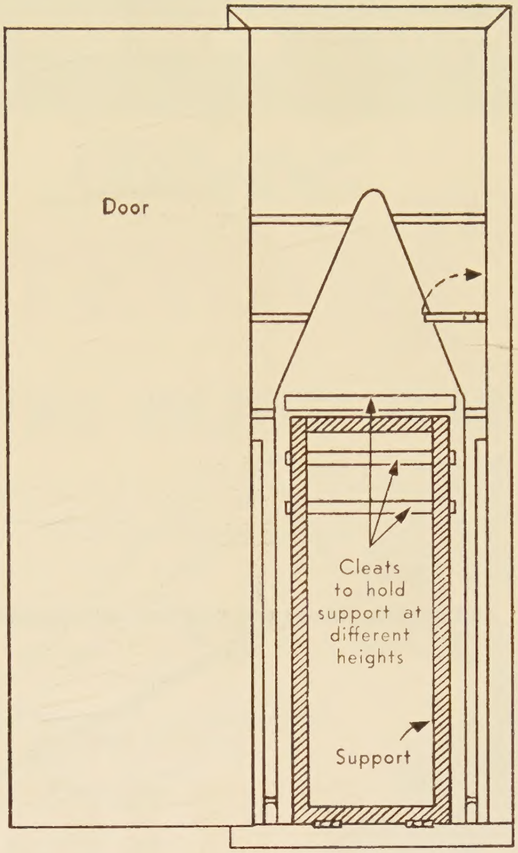


A built-in ironing board of adjustable height: The board extended, the height-adjusting groove and slots in the side of the cupboard, and the shelves at the back of the cupboard.



The board folded back against the shelves and held in place by a piece of wood attached to one shelf.

to a standing height suitable for a tall person.

Many women say that they cannot iron sitting down, but very often this is because they have never tried to get used to it. To save continual jumping up and down by the housewife the basket of unironed clothes must be placed close to the board at one end and a table or hanging rails for the ironed clothes at the other end. Some women feel that sitting down to iron is the lazy way, but there is no reason why the housewife should not prevent her back from getting tired and her feet from aching. Ironing is a job which the housewife may often do in the evening after a long day's work, and then it is even more important, for her family's sake as well as her own, that she should work in comfort.

Different Types of Ironing Boards

The type of ironing board chosen will depend on choice and on the space available. One housewife may prefer a movable board, which may be set up in whichever room she chooses to do the ironing. The folding board must have a well supported frame to prevent it from swaying. As well as the usual wooden type of board, lightweight aluminium boards are now available. A folding board requires cupboard space or a suitable corner so that it can be stored out of the way. Attachments can be made to hold the board against the wall, behind a door, or in some inconspicuous corner.

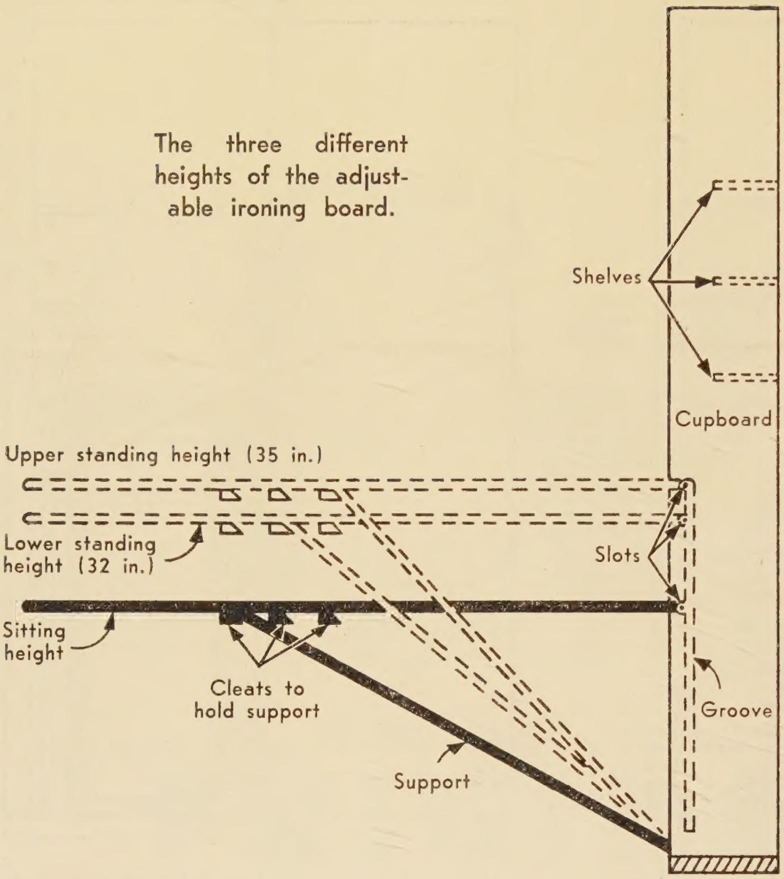
Another type of folding board has only one supporting leg and must be clamped to a table. This means that there must be a suitable table near an electric point, and it also means that if the table is too low, the board when in position will also be too low.

In many new homes the ironing board is built into a shallow cupboard so that it can very easily be set up for ironing and put away again out of sight when not in use. This arrangement is especially satisfactory if the board is in the ideal position for ironing and if there are shelves in the cupboard or near it for storing equipment such as the iron, sleeve board, and pressing cloth. The board can fold up against the shelves. The door of the cupboard should open to the left for a right-handed person so that it will not be in her way.

A Built-in Adjustable Board

The built-in board illustrated in the diagrams can be adjusted to three different heights—a sitting height and two standing heights. The shelves for the ironing equipment are set back in the cupboard, 4 to 5 in. being left in front for the board when it is folded up. If there is not sufficient room for a cupboard 10 to 12 in. deep, the board can be built into the depth of a wall, fitted between two studs, but shelves would have to be allowed in a nearby cupboard for storing equipment.

Grooves are cut in the sides of the cupboard to support the end of the board, as in the diagram at left on this page. Three slots run forward from each groove at the three required heights. A square wooden rod is screwed securely on to the end of the ironing board and has rounded ends to fit into the grooves and slots on each side of the cupboard.



The three different heights of the adjustable ironing board.

The diagram at right on page 311 shows the ironing board folded for storage. A piece of wood attached to the edge of one shelf can be pulled down in front of the board to hold it in position. The support folds back against the board, and this also may need a clip to hold it back in position.

The last-named diagram also shows three cleats nailed to the bottom of the board. The top of the support fits in behind one or other of these cleats, according to the required working height of the board, as shown in the diagram on this page.

The Ironing Surface

The best surface for an ironing board is a perforated metal top, which allows steam to escape. With the usual solid wooden board a considerable amount of moisture collects on top of the board and prevents the clothes from drying properly. Ironing on a laminated plastic table is not recommended. An unpainted wooden surface does absorb some moisture, but a laminated plastic surface does not absorb any. A perforated board is particularly valuable when a steam iron is used or when dampened clothes are being ironed.

No matter what type of board is chosen, it should be 54 to 60 in. long and one end should be narrower than the other to allow frocks and other double garments to be slipped over easily. It is advisable to have rubber feet on the board to stop it sliding or scratching the floor.

Location of the Board

It is best to keep the ironing board as near as possible to the position where it is normally used. If a built-in ironing board is being planned in a new home, consideration should be given to the choice of the ideal situation for ironing.

The board should be placed where the housewife will be able to work in comfort and warmth and where it will be least likely to obstruct a passageway. It is also important to have the board where it will get good natural and artificial light. If possible, it is an advantage to have it placed near a table on which the clothes can be sorted and on which the ironed and folded clothes can be placed. It is a help to have a rack for hanging folded articles which need further drying.

The best position for the electric point is on the opposite side of the ironing board from the worker and about 42 in. from the floor.

Occasionally, especially in a two storeyed house, it may be an advantage to have two boards. One could be kept downstairs for everyday use and the other upstairs for ironing frocks and evening clothes or for guests to use.

Covers for Ironing Boards

The ironing board should be well padded to allow some give under the pressure of the iron, making the work easier. The outer cover can be of sheeting or some such strong material, and should be removable so that it can be washed frequently. It can be fastened to the board by tapes tied across the bottom of the board or by a drawstring running through a hem round the edge of the cover. Whichever way the cover is tied it should be fitted as tightly as possible over the board. Many new boards have a metal rod round the edge to clamp over the cover and hold it in place.

Other Equipment

Apart from the ironing board and the iron other pieces of equipment can be added to the list to make the ironing easier. A pressing cloth is essential and one should be kept at hand to save a fresh search for a suitable cloth every time ironing is done. A bottle with a sprinkler top is best for dampening clothes, though a sponge or small paint brush can serve the same purpose. A cord holder is very useful for holding the ironing cord up from the board and preventing it from dragging across the clothes. It is a metal arm which clamps to the side of the board and has a loop at the top to hold the cord.

Another useful addition to the equipment is a sleeve board, and many modern ironing boards include detachable sleeve boards. A sleeve board is particularly useful for ironing narrow sleeves, a gathering on a curve such as on a gathered sleeve cap, and children's clothes. A sleeve board which is attached to the ironing board as shown in the illustration at right on page 309 should be built at least 4 in. above the board to leave room to rest the iron. For pressing darts or the curve of a shoulder, or for shrinking fullness at the top of a sleeve, a tailor's cushion is very useful. The cushion can be simply made by cutting two oval pieces of material about 7 in. by 10 in. The two pieces can then be sewn together and stuffed firmly with cottonwool.

In many new homes specially insulated metal compartments for the iron are being built into the wall. These are a great advantage, because the iron does not have to be left out to cool, but can be put away hot without any fear of small children burning themselves.

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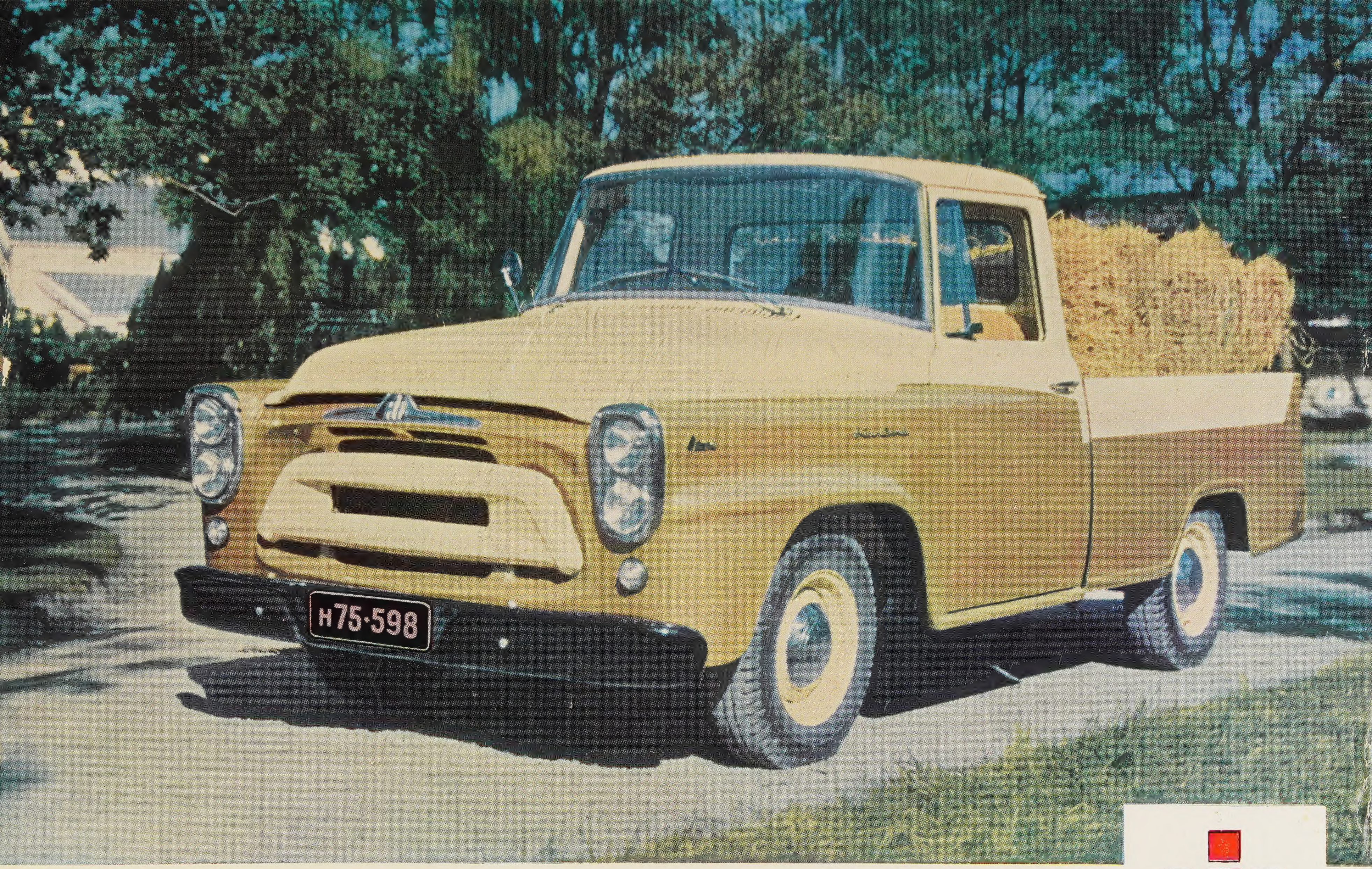

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